CHANGES IN BODY IMAGE AND SEXUALITY IN RURAL BREAST CANCER SURVIVORS DURING A WEIGHT LOSS AND WEIGHT MAINTENANCE INTERVENTION

By

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Abstract

This study evaluated changes in body image dimensions in breast cancer survivors after a weight control trial and predictors of those changes. Postmenopausal rural breast cancer survivors enrolled in an 18-month phone-based weight loss and weight maintenance intervention participated. Data was collected at baseline, 6-months (post-weight loss intervention), and 18-months (post-weight maintenance intervention). Participants were randomized into either a phone-based group condition or mail-based condition during the weight maintenance intervention. The Body Image and Relationships Scale (BIRS) assessed six dimensions of body image relevant for breast cancer survivors, including sexuality. All six body image subscales and total score improved upon completion of the weight loss intervention (p's < .001). Weight loss and physical activity changes were less predictive of those improvements than age, breast cancer treatment history, and baseline depressive symptoms and quality of life. All but one BIRS dimension worsened between the weight loss and weight maintenance intervention, with a significant interaction effect by maintenance treatment condition observed for one subscale. Weight regain, marital status, breast cancer treatment history, and baseline depressive symptoms were predictive of changes in body image dimensions from 6- to 18-months. Improvements in body image dimensions during the weight loss intervention were unrelated to weight regain. Despite the worsening in body image during the weight maintenance intervention, it appears that the improvements gained during the weight loss intervention, regardless of the amount of weight lost, were only partially attenuated during weight regain.

Keywords: Body image, sexuality, breast cancer, survivorship, weight loss, weight maintenance

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The Significance of Breast Cancer

Breast cancer is the most prevalent cancer among women in the United States, with over 3.1 million women currently living with the disease (DeSantis et al., 2014). The median age at diagnosis is 61 years (Howlader, Noone, & Krapcho, 2011), with women in the 20-24 age bracket at the lowest incidence rate and women in the 75-79 age bracket at the highest incidence rate (American Cancer Society, 2013). Weight has a significant impact on risk, with overweight (BMI 25-29.9 kg/m^2) and obese (BMI > 30 kg/m^2) postmenopausal women at a 1.3-1.5-fold increased risk (Huang et al., 1997; Morimoto et al., 2002). Obese breast cancer survivors have a 1.5-2.5-fold increased risk of recurrence and death compared to their normal weight counterparts (Chlebowski, Aiello, & McTiernan, 2002; Cleveland et al., 2007; Kroenke, Chen, Rosner, & Holmes, 2005). Weight gain exceeding 6-10 kg has been associated with increased risk of cancer recurrence (Camoriano et al., 1990; Chlebowski et al., 1986). This is particularly problematic given evidence that weight gain is common after diagnosis and treatment, with a majority of women under the age of 60 gaining between 2-8 kg of pre-cancer weight and many gaining more than 8 kg (Caan et al., 2005). Women who receive chemotherapy are particularly more likely to gain more than 5% of their pre-cancer weight than women not receiving chemotherapy, and often sustain that weight gain over time (Saquib et al., 2007). A number of additional life domains can be affected. For example, fertility concerns and early menopause are issues often experienced by young survivors, whereas weight gain and altered appearance of the breast(s) are common concerns for survivors at all ages. These and other survivorship issues are necessary to

consider as survival rates continue to improve; the 5-, 10-, and 15-year survival rates are currently 89%, 82%, and 75%, respectively (American Cancer Society, 2011).

Treatment effects on psychosocial domains. There is a wealth of research evaluating various quality of life domains in cancer survivors contributing to what is known about cognitive, behavioral, emotional, and social issues. In fact, the area of psychosocial oncology was born out of the understanding that oncology patients have a unique set of experiences that are important to quality of life after treatment ends. Both during and after cancer treatment, a survivor's quality of life is often challenged (Howard-Anderson, Ganz, Bower, & Stanton, 2012; Montazeri, 2008). For example, even 18-months post-treatment, survivors continued experiencing concerns related to role functioning, emotional functioning, cognitive functioning, social functioning, global quality of life, fatigue, pain, body image, sexual functioning, and sexual enjoyment (Montazeri et al., 2008). A consistent finding among breast cancer survivors is that body image is affected by treatment, regardless of type of surgery and adjuvant treatment (Montazeri, 2008), with as many as 77% of survivors reporting body dissatisfaction (Avis, Crawford, & Manuel, 2004). Similarly, sexuality is often coupled with body image, and is also consistently negatively impacted by treatment (Howard-Anderson et al., 2012). In one study evaluating the qualitative nature of changes in sexuality after breast cancer treatment, 73% of participants reported problems with sexual arousal, 73% reported feeling less sexually desirable, and 64% reported a decrease in sexual desire (Ussher, Perz, & Gilbert, 2012).

Conceptualization of Body Image

Body image is not a well-defined construct. In fact, there are at least 14 different terms to describe some aspect related to body image in the literature (Thompson, 2004; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Many studies define body image as including

perceptual, affective, cognitive and behavioral aspects of the body experience (Cash & Pruzinsky, 1990). There is often a focus on shape and weight (Tiggemann, 2004) in both general body image research and cancer-related body image research.

Several theories have been constructed to better define body image. One of the oldest theories relevant to body image is social comparison theory (Festinger, 1954). Social comparison theory states that it is natural for individuals to gather information about themselves by comparing themselves with others in the environment. Similar to social comparison theory is a social norms approach to understanding body image. The social norms approach specifies two types of influences, including 1) descriptive norms, and 2) injunctive norms (Bergstrom & Neighbors, 2006). Descriptive norms describe the prevalence of certain thoughts, behaviors, and attitudes held by a group of people. An example of a descriptive norm is, "85% of men believe breasts are an important part of a woman's sexuality." Injunctive norms describe what should or should not occur; in other words, injunctive norms carry an evaluation or judgment. An example of an injunctive norm is, "A majority of men believe that a woman's breasts *should* be an important part of her sexuality." These injunctive norms can be a powerful influence on a woman's evaluation of her own appearance and to what extent she experiences body dissatisfaction and a diminished body image.

Another theory, self-objectification theory (Fredrickson & Roberts, 1997), states that in our society, women internalize an observer's perspective of their physical appearance as a result of cultural demands to objectify the female body. Over time, women believe that they are an object to be evaluated and judged. This often leads to habitual body-checking and concern about appearance. Social comparison theory, the social norms approach, and self-objectification theory focus on perceptual components of body image and how perceptions lead to the development of

body dissatisfaction. However, none of these theories focus on how these perceptions can be changed over time due to the influence of age or health status.

As women age, physical functioning and health become important components of body image (Whitbourne & Skultety, 2002). The lifecourse perspective (Thompson, 2002) suggests that these functional components should be accounted for in body image measurement, especially when being used in an older sample or in a sample with certain functional limitations due to illness or injury. This perspective acknowledges that body image can change over the course of a lifetime, and that body dissatisfaction does not completely define the construct.

Another model, the cognitive behavioral (CB) model, has gained momentum within general body image research (Cash, 2011), and has been proposed in body image research within psychosocial oncology (White, 2000). The CB perspective consists of three different constructs highlighting cognitive and behavioral themes related to body image. The first, body image schema (Altabe & Thompson, 1996), is based on the concept of schema, which is defined as a cognitive structure that serves as a template to direct attention, influence the interpretation of stimuli, and aid in recall (White, 2000). Specifically, cues from the environment activate the processing of information related to appearance, which is interpreted positively or negatively according to the individual's pre-existing body image schema. This in turn can have consequences on other body image constructs such as increased negative thoughts or problems adjusting to an altered appearance (White, 2000). For example, a cue activating a woman's body image schema may be a television commercial advertising women's underwear. If the woman has a negative body image schema, watching the commercial may produce negative thoughts about her own appearance.

The second construct contributing to the CB perspective is self-discrepancy theory (Higgins, 1987). This construct focuses on the importance of the relationship between two cognitive structures being perceived by an individual: an ideal-state representation and an actual-state representation. This discrepancy can be assessed from the perspective of the individual (i.e., from the "self" perspective), or from the perspective of the "other" onlooker. Often, the discrepancy noted from the "self's" perspective leads to body image emotions such as disappointment, whereas discrepancies noted by the "other's" perspective leads to the body image emotion of shame (Higgins, Klein, & Strauman, 1985).

Investment in appearance (Cash & Szymanski, 1995) is the third construct informing the CB model. This construct takes into account the investment, or importance, an individual places on the discrepancy between the ideal-state and actual-state from both the "self" and "other" perspectives. In some cases, it is possible for a discrepancy to exist, yet the individual is not concerned and places little importance on the discrepancy. There are multiple ideal-self discrepancies, such as discrepancies based on weight, height, breast size, facial features, and other specific body parts; some discrepancies may be considered important while others are not. Even so, investment in only one discrepancy may lead to psychosocial consequences such as social anxiety and depression (Cash & Szymanski, 1995).

The CB approach to body image has been found to be particularly helpful in measuring a number of dimensions that highlight the cognitive, behavioral, and emotional components. This model has also been applied to body image interventions to target specific distorted thinking patterns and maladaptive behaviors such as body checking, mirror gazing, avoidance, social comparison, and reassurance seeking (Reas & Grilo, 2004).

A multi-dimensional framework. Given the lack of a "gold standard" definition of body image, researchers are moving to a multi-dimensional framework. Much of the literature operationalizes body image as dissatisfaction with appearance, but that is clearly only one dimension of the construct. Researchers began proposing this integrated perspective of body image during the 1980's (Cash & Green, 1986), and dozens of studies were completed, mostly with female undergraduates. Besides body dissatisfaction, researchers included dimensions such as body-size distortion, preference for thinness, fear of fatness, body importance, dieting behavior, and avoidance (Banfield & McCabe, 2002; Gleaves, Williamson, Eberenz, Sebastian, & Barker, 1995). These constructs may have been helpful for describing poor body image in young, healthy, white women and for predicting disordered eating, but these constructs do not fully capture the experience of a breast cancer population.

In addition to the dimensions described above as measured in healthy populations, breast cancer survivors may also experience a loss of femininity, avoidance of activities due to embarrassment from treatment side effects, loss of energy and strength, loss of body integrity (e.g., feeling natural, healthy, or whole), loss of sense of control over their appearance or strength, and a change in sexuality (Hormes et al., 2008). These experiences describe the emotional, cognitive, and behavioral dimensions of body image, but also focus on the physical and physiological changes resulting from treatment that impact body image. These dimensions extend beyond body dissatisfaction and are specific to breast cancer survivors.

The Role of Sexuality in Body Image

The construct of sexuality in breast cancer research has similar problems as body image, with lack of a clear definition indicating little consensus about the dimensions comprising

sexuality. Some definitions of body image include sexuality, yet sexuality is often not included in measures of body image (Roid & Fitts, 1988).

Researchers have typically defined sexuality through biological and psychosocial influences. Biologically, it is dictated by neurological, vascular, and hormonal systems (Bachmann & Philips, 1998), and is also influenced by family, society, religious values, the aging process, health status, personal experience, attitudes, and needs brought to the relationship by both partners (Karabulut & Erci, 2009). Because sexuality is a broad concept, it has a number of components that can be evaluated, including frequency of sexual activity (Arora et al., 2001), sexual interest (e.g., one's interest in engaging in sexual activity; Avis et al., 2004), sexual avoidance (e.g., whether one intentionally ignores or avoids sexual advances by a sexual partner; Yurek, Farrar, & Andersen, 2000), sexual satisfaction (e.g., how satisfied one is with their sexual relationship or the frequency of sexual activity; Ganz, Desmond, Belin, Meyerowitz, & Rowland, 1999), sexual attractiveness (e.g., self-perceptions of how attractive one feels sexually; Burwell, Case, Kaelin, & Avis, 2006), sexual health (comprised of sexual interest, sexual dysfunction, and sexual dissatisfaction; Ganz et al., 1999) and sexual dysfunction. Sexual dysfunction in women is typically described clinically to evaluate disruption within the sexual response cycle (Masters & Johnson, 1966), and includes problems with sexual desire, sexual arousal, orgasm, and sexual pain (Basson, Wierman, Van Lankveld, & Brotto, 2010).

How body image and sexuality relate. A recent review of sexuality and breast cancer found that body image is commonly related to and often a significant predictor of sexual dysfunction and sexual activity in breast cancer survivors (Emilee, Ussher, & Perz, 2010). For example, Ganz et al. (1999) found that having a new partner, positive mental health, and positive body image (i.e., not experiencing discomfort or embarrassment about one's body after breast

cancer treatment) explained 33% of the variance for sexual interest in survivors. Similarly, lower perceived sexual attractiveness is one of the strongest predictors of sexual problems after breast cancer treatment, with 20% of a study sample reporting dissatisfaction with sex and between 16% and 42% reporting problems related to sexual interest, arousal, relaxation, and orgasm following treatment (Burwell et al., 2006). Because of the strong relationship between body image and sexuality among breast cancer survivors, researchers often include items reflecting both constructs in an attempt to collect a global picture of body image and sexuality (Al-Ghazal, Fallowfield, & Blamey, 2000; Avis et al., 2004; Carver et al., 1998; den Heijer et al., 2012; Petronis, Carver, Antoni, & Weiss, 2003).

In healthy women, a number of body image dimensions are significantly related to sexual satisfaction. For example, weight concern, sexual attractiveness, and body esteem have strong positive correlations with sexual satisfaction with correlations ranging from $r = .30$ to .51 (Pujols, Meston, & Seal, 2010). Additionally, Koch, Mansfield, Thurau, & Carey (2005) found that women of all ages are more likely to consider themselves as more attractive ten years ago than at their current age, and the greater the discrepancy between their decade-earlier and current rating of attractiveness, the more likely they are to report a decline in sexual desire and frequency of sexual activity. Women who have stable self-perceptions of attractiveness are more likely to maintain stable levels of sexual desire, orgasm, satisfaction with sexual activity, and frequency of sexual activity.

Wiederman & Hurst (1997) have summarized possible explanations linking body image and sexuality. Dissatisfaction with one's body appearance may lead to sexual avoidance and ultimately sexual dysfunction. In addition, past sexual experiences may influence a woman's view of her own attractiveness. For example, a woman could have had a partner that was critical

of how the woman's body looked in the nude, which consequently altered her self-perceived body image. A third possibility is that body imperfections or changes in body appearance discourage advances from sexual partners. These body imperfections not only influence potential partners, but may also limit the woman's behaviors and willingness to engage in sexual activity. This may be especially true for breast cancer survivors who have physical changes in the appearance of their breast(s), experience weight gain, or experience menopausal changes leading to vaginal dryness (Burwell et al., 2006; Meyer & Aspegren, 1989).

Another potential framework linking body image and sexuality is related to *spectatoring*, a cognitive process described by Masters & Johnson (1966) as vigilance over one's own body parts and the effect of this vigilance on sexual functioning. Spectatoring has been found to be associated with sexual inexperience and sexual dysfunction (Faith & Schare, 1993). Other studies have found that sexual inexperience as a result of body self-consciousness is more related to disengagement and general avoidance of sexual behavior (Trapnell, Meston, & Gorzalka, 1997) rather than problems with spectatoring. Either way, poor body image drives infrequency of sexual activity. For example, Wiederman (2000) found that body image emotions, measured with a self-consciousness scale as feelings of rejection and distress at social events, were predictive of the extent and frequency of sexual experiences, sexual esteem (e.g., self-views as a sexual partner), sexual assertiveness (e.g., expression of desires to one's sexual partner), and avoidance of sexual activity (e.g., intentionally avoiding potential sexual interactions). Given the strong relationship between the constructs of body image and sexuality, they should both be assessed using comprehensive, validated measures in order to build evidence in support of a body image/sexuality framework, especially within the breast cancer survivor population.

Breast Cancer Treatments and Side Effects

Treatment trajectories for breast cancer patients vary based on extent of the disease, likelihood of aggressive cancer-cell replication, and tumor-type. All forms of medical intervention used in the treatment of breast cancer can have lasting physical and emotional effects, especially in regards to body image and sexuality.

Surgical procedures. The least invasive surgical option available to some breast cancer patients is a lumpectomy, also known as breast conserving surgery. Lumpectomies involve the removal of cancerous tissue and a small surrounding area of normal tissue (American Cancer Society, 2011). In contrast, a simple or total mastectomy is the removal of the entire breast, a modified radical mastectomy is the removal of the entire breast in addition to lymph nodes under the armpit, and a radical mastectomy is the removal of the entire breast, lymph nodes under the armpit, and the chest wall muscle (American Cancer Society, 2011). Radical mastectomies are rarely used because they are no more effective at preventing recurrence as other types of mastectomies and are also more disfiguring due to the removal of the chest wall muscle. Mastectomies can be unilateral (i.e., removal of one breast) or bilateral (i.e., removal of both breasts).

Women undergoing mastectomies are often given the option to receive immediate or delayed reconstructive surgery based on oncologist recommendations and patient wishes. Reconstruction can be done with silicone implants or with tissue from other parts of the body (American Cancer Society, 2011). Although reconstruction provides the shape and appearance of having breasts, the actual reconstructed breasts often do not include features of a natural breast (e.g., nipple; sensitivity to touch). Breast reconstruction is a complicated process that can take months to complete. Once mastectomy is complete, women have tissue expanders inserted to

keep the skin around the breast region stretched to accommodate implants. The skin expanders are injected with saline over the course of a 4- to 6-month period to continue stretching the skin. The implant placement can then begin once the skin is large enough to cover the area around the implant. Additional surgeries may be necessary after the initial reconstruction depending on type of reconstructive surgery (i.e., silicone implants versus tissue implants). Some women also undergo nipple and areola reconstruction as an outpatient surgical procedure to hide scars from prior surgeries and to provide a more natural appearance to the breast. This often involves using tissue from the reconstructed breast and/or tattooing the area to mimic the appearance of an areola (Steligo, 2005).

Chemotherapy. Chemotherapy consists of a combination of medications given in cycles for a period of time, often months, either orally or through a port inserted into the skin (American Cancer Society, 2011). Chemotherapy cycles begin shortly after surgery and work by destroying cancerous cells in the body to prevent further cancer-cell replication. However, chemotherapy destroys rapidly-dividing cells indiscriminately, meaning that healthy cells can also be targeted leading to side effects such as alopecia (DeSimone et al., 2012), nausea (DeSimone et al., 2012), fatigue (Richardson & Ream, 1996), cognitive changes (e.g., forgetfulness, difficulty paying attention or concentrating; Tchen et al., 2003), neuropathy/pain (Bhagra & Rao, 2007), and early menopause for women who are premenopausal (Ganz, 2005).

Radiation. Radiation is a targeted form of cancer treatment that directly kills cancer cells in a particular region of the body and further helps prevent the cancerous cells from replicating. The most common form of radiation therapy is external beam radiation, which involves directing a radiation beam over the affected area (American Cancer Society, 2011). Side effects of radiation include fatigue (Sjövall, Strömbeck, Löfgren, Bendahl, & Gunnars, 2010), scarring,

skin irritations, and nerve damage (DeSimone et al., 2012). Another form of radiation, brachytherapy, is a common therapy used by women with Stage 0 disease. Brachytherapy involves the surgical placement of a catheter into the breast cavity that is then used to deliver directed, internal radiation to the area previously containing cancerous cells (American Cancer Society, 2011). This method typically involves discomfort and residual scarring from where the catheter protruded from the skin.

Anti-hormone therapies. For estrogen-receptor positive tumors, anti-hormone therapy is typically recommended for approximately five years in order to prevent estrogen from stimulating cancer cell growth (American Cancer Society, 2011). Two common anti-hormone medications are Tamoxifen, an oral medication that blocks the effects of estrogen, and aromatase inhibitors, an oral medication that reduces the amount of estrogen synthesized in the body. The side effects of these medications can be intense and include severe hot flashes, night sweats, vaginal dryness, vaginal discharge, arthralgia (i.e., joint pain), fatigue, cognitive problems (e.g., forgetfulness), osteoporosis, and infertility for younger women (Ganz, 2001a, 2001c; Ganz, Greendale, Petersen, Kahn, & Bower, 2003; Greendale, Petersen, Zibecchi, & Ganz, 2001). The most prominent of these side effects is vaginal dryness and hot flashes with approximately 70% of survivors reporting these symptoms (Glaus et al., 2006), followed by weight gain, which occurs in 50-96% of breast cancer survivors taking anti-hormone therapy (Goodwin et al., 1999). Fatigue is another common side effect that has been found to affect between 30-40% of breast cancer survivors (Bower et al., 2000; Lindley, Vasa, Sawyer, & Winer, 1998), although it is commonly caused by anti-hormone therapy in addition to the effects from chemotherapy or radiation (Ganz, 2001c). Because women typically take these medications for five years, these side effects can have chronic consequences.

Breast Cancer Treatment Effects on Body Image and Sexuality

Surgery effects on body image. The effects of surgery have largely been focused on differences in body image observed between women receiving lumpectomies and women receiving mastectomies with or without reconstruction. In general, results between surgical groups are mixed. There are a number of studies finding that women who received lumpectomies had lower body dissatisfaction than women who received mastectomies with or without reconstruction, even four years post-diagnosis (Falk Dahl, Reinertsen, Nesvold, Fosså, & Dahl, 2010; Mock, 1993; Moyer, 1997; Schover, 1991). In contrast, other studies have not found differences in body dissatisfaction between surgery type (Goldberg et al., 1992; Schover et al., 1995). One explanation for these mixed results is related to the characteristics of study participants. For example, the effects of surgery type on body image have been found to be especially salient in younger women. While women who received mastectomies had higher body dissatisfaction than women who received lumpectomies, younger women under the age of 50 who received mastectomies had significantly higher levels of body dissatisfaction and social avoidance than older women who received mastectomies (King, Kenny, Shiell, Hall, & Boyages, 2000).

Differences across studies can also be attributed to heterogeneity in measurement tools. For example, in a recent meta-analysis comparing body image between women who received mastectomy with reconstruction and women who received mastectomies without reconstruction or lumpectomies, within the 12 studies that qualified for the meta-analysis, none of the studies measured more than three domains of body image (Fang, Shu, & Chang, 2013). However, all of the studies used different tools to measure body image, ranging from tools used in the general population focusing on satisfaction with body shape and appearance (e.g., Multidimensional

Body-Self-Relations Questionnaire; MBSRQ; Cash, 2000), to items developed by researchers that included breast cancer-related concerns such as embarrassment or discomfort due to treatment (Baxter et al., 2006). Of the twelve studies included in the meta-analysis, five used a self-designed questionnaire. By comparing across measurement tools and across dimensions of body image, it is clear why there are mixed findings between surgical groups. Studies that have not found significant differences between surgery type used measurement tools that were focused on satisfaction with body shape, weight, and appearance in general (Fang et al., 2013; Goldberg et al., 1992; Schover et al., 1995). Typically, when differences are found between surgery type, the measurement tools focused on breast cancer-specific concerns such as discomfort or embarrassment due to treatment, breast-specific concerns, and body integrity (Arora et al., 2001; Falk Dahl et al., 2010; Fang et al., 2013; Yurek et al., 2000). For example, Cocquyt et al. (2003) investigated body dissatisfaction between women who received a lumpectomy and women who received mastectomy with reconstruction. Body dissatisfaction was measured at the first post-surgical follow-up visit with eight items created by the researchers, such as "Satisfied with body when dressed," "Dissatisfied with appearance of breasts," and "Altered body image as before surgery." Between the two surgical groups, women who had mastectomy with reconstruction had significantly higher body dissatisfaction than women who received a lumpectomy.

Surgery effects on sexuality. Similar to the body image research, findings on sexuality changes as a result of breast surgery are mixed. Some studies have found that women receiving lumpectomies have better sexuality outcomes than women receiving mastectomies with or without reconstruction (e.g., Meyer & Aspegren, 1989). In contrast, other studies have not found any differences between surgery type and sexuality using single-item questions to evaluate outcomes such as sexual satisfaction, frequency, and function (Dorval, Maunsell, & Deschenes,

1998; Lasry, 1991; Schover et al., 1995). One reason for these discrepancies could be due to participant characteristics. One study attempted to isolate the impact of surgery from other treatments by including breast cancer survivors who had recently undergone surgery but had not yet begun adjuvant treatment (Yurek et al., 2000). Interestingly, using measures of sexual behavior frequency and the sexual response cycle, women who received reconstruction reported significantly lower rates of sexual activity and fewer signs of sexual responsiveness in regards to the sexual response cycle than women who received a mastectomy without reconstruction and women who received a lumpectomy. Because having reconstruction is an elective decision, it is possible that there are inherent differences between women who choose reconstruction and those who do not. There is little research investigating characteristics among women who elect for reconstructive surgery, but there is some evidence that women who have reconstruction are younger and have an elevated investment in appearance (Reaby, 1998). For example, Reaby (1998) found that women who elected for reconstructive surgery did so because 1) they would no longer need to wear a breast prosthesis, 2) they would be able to wear different types of clothing, 3) they believed the surgery would help them regain a sense of femininity, and 4) they believed the surgery would help them regain a sense of body integrity and to feel whole again. However, these characteristics do not completely explain the decision-making process. Women may not choose reconstruction due to a fear that the cancer will recur, because they do not fully understand the surgeries or options available to them, or because they do not see reconstruction as being essential for physical well-being (Nelson et al., 2013).

Discrepant findings are likely also due to a lack of conceptual clarity or universal understanding of the constructs being measured, resulting in differing operational definitions of sexuality (Avis et al., 2004). For example, some studies measure sexuality with the Derogatis

Sexual Functioning Inventory (Derogatis & Melisarotos, 1979), which includes items such as "I have a shapely and well-proportioned body" and "There are parts of my body that I don't like at all" (Makar et al., 1997). Other studies measure sexuality by evaluating sexual dysfunction at various stages of the sexual response cycle (Biglia et al., 2010; Masters & Johnson, 1966). Clearly these tools are measuring different constructs with the former measuring sexual attractiveness and body dissatisfaction, and the latter measuring clinical sexual dysfunction. Many studies measure other aspects of sexuality using single-item questions developed by researchers, such as "How sexually desirable do you feel?" (Carver et al., 1998). Others only include certain items from measures of sexuality. For example, Ganz et al. (1999) measured sexual dissatisfaction with a single-item question from the Sexual History Form ("Overall, how satisfactory to you is your sexual relationship with your partner?"; Schover & Jensen, 1988). Surgical effects between women who received lumpectomies and women who received mastectomies with or without reconstruction are common when sexual attractiveness, sexual desirability, and sexual avoidance are measured. Specifically, women with lumpectomies report less avoidance of looking at or touching their own breasts, more interest in sexual activity, and satisfaction with their sexual relationships (Meyer & Aspegren, 1989; Panjari, Bell, & Davis, 2011; Yurek et al., 2000).

There is less support of surgical effects when measuring sexual dysfunction, but some effects have been found at stages of the sexual response cycle. A recent cross-sectional study sought to determine the prevalence of clinically diagnosable sexual dysfunction in Dutch women with breast cancer, and whether the rates of sexual dysfunction varied depending on type of surgery received (Kedde, van de Wiel, Weijmar Schultz, & Wijsen, 2012). Approximately half of study participants completed adjuvant therapy within the past six years while the other half

was receiving chemotherapy, radiation, or anti-hormone therapy at the time of measurement. Sexual dysfunction was defined as impairment at any point of the sexual response cycle (Masters & Johnson, 1966) as measured by the Dutch version of the Questionnaire for Screening Sexual Dysfunctions (Vroege, 1995). Sixty-four percent of participants currently receiving adjuvant treatment were identified as having some type of sexual dysfunction, compared to 45% of participants who had completed adjuvant therapy. Receiving a mastectomy was associated with being diagnosed with female orgasmic disorder, but no other surgery was related to the occurrence of sexual dysfunction.

Adjuvant treatment effects on body image. Chemotherapy, radiation, and anti-hormone therapies typically follow surgery. For this reason, it is nearly impossible to measure the direct effects of adjuvant therapies alone on dimensions of body image. However, it is common to investigate the associations between various types of adjuvant treatment and body image. In a study by Begovic-Juhant, Chmielewski, Iwuagwu, & Chapman (2012), 70 participants who were between one and five years post-diagnosis rated their physical attractiveness, femininity, and satisfaction with their naked self currently as a result of their treatment using items selected from the European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire-Breast Cancer (ORTC QLQ-23; Sprangers et al., 1996), such as "Have you felt physically less attractive as a result of your treatment?" Eighty-one percent of the sample reported feeling less attractive, 74% reported feeling less feminine, and 79% reported that it was more difficult to look at themselves naked after cancer treatments. Chemotherapy, but not radiation or anti-hormone therapy, had medium to high associations (r = .29 to .45) with the body image items, indicating that chemotherapy resulted in decreased physical attractiveness, decreased femininity, and decreased satisfaction with the naked self as a result of treatment.

There is limited evidence that radiation and anti-hormone therapies negatively impact body image. Rosenberg et al. (2013) evaluated correlates of body image in breast cancer survivors under age 40 who had been diagnosed within six months of enrollment. Body image was assessed using the Cancer Rehabilitation Evaluation System (CARES; Ganz, Schag, Lee, & Sim, 1992), with the items, "I am uncomfortable with the changes in my body," "I am embarrassed to show my body to others because of my illness," and "I am uncomfortable showing my scars to others." Participants rated how much each statement applied to them on a 5-point Likert scale. Treatment with radiation, but not chemotherapy or anti-hormone therapies, was a significant predictor of poor body image. However, only 18% of the study sample (n = 77) completed radiation. Other studies evaluating the unique associations between radiation and anti-hormone therapies and body image have not found significant associations (Collins et al., 2011; Fobair et al., 2006; Schover et al., 1995).

Adjuvant treatment effects on sexuality. Changes in sexuality are well-documented for the effects of adjuvant treatment due to the direct physiological impact treatments such as chemotherapy, radiation and anti-hormone therapy have on the body. In fact, approximately 35% of survivors reported that adjuvant treatment had a direct negative impact on various aspects of their sex life (Ganz et al., 2004). There is evidence that within the first year after chemotherapy, it is common for women to experience increased levels of sexual dysfunction such as lack of sexual interest (prevalence rates between 21% and 64%), difficulty becoming sexually aroused (prevalence rates between 17% and 33%), difficulty reaching orgasm (prevalence rates between 14% and 23%), difficulty relaxing and enjoying sex (prevalence rates between 17% and 33%), decreased satisfaction with sex (prevalence rates between 14% and 20%) and decreases in sexual activity (prevalence rates approximately 50%; Arora et al., 2001; Barni & Mondin, 1997;

Burwell et al., 2006; Fobair et al., 2006; Ganz et al., 2004; Yurek et al., 2000). Rates of sexual dysfunction in breast cancer survivors are higher than the rates for healthy postmenopausal women, with approximately 34%, 17%, 19%, and 15% of healthy postmenopausal women experiencing lack of sexual interest, lack of sexual arousal, difficulty reaching orgasm, and dissatisfaction with sex, respectively (Hayes, Dennerstein, Bennett, & Fairley, 2008; Martelli et al., 2012). Many survivors taking anti-hormone therapy experience problems with lower perceived sexual attractiveness (prevalence rates between 26% and 39%) and sexual function, with prevalence rates as high as 70% when combining the various types of sexual dysfunction, such as problems with desire, arousal, and reduction in activity (Avis et al., 2004; Knobf, 2001; Panjari et al., 2011; Rowland et al., 2000). Even over time, the impact on sexuality persists (Ganz et al., 1999). For example, Biglia et al. (2010) found that there was a significant decrease in interest in sexual activity, frequency of sexual activity, ability to experience arousal, satisfaction with sexual partner, and sexual desire six months after chemotherapy or radiation and an additional significant decrease in these outcomes one year post-treatment. After surgery and prior to starting adjuvant treatment, 77.1% of participants reported sexual activity during the previous four weeks. Six months after chemotherapy or radiation, that percentage dropped to 37.1%, and dropped again to 34.4% one year post-treatment.

Time since treatment. Treatment effects have been found to last for years, even decades, after treatment (Lam et al., 2012; Ussher et al., 2012). For example, den Heijer et al. (2012) aimed to measure the longitudinal course of body dissatisfaction in women prior to receiving mastectomy, 6-months post-surgery, and again six to nine years later. Body dissatisfaction increased at 6-months post-surgery. Between 6-months and six to nine years post-surgery, only breast-related body dissatisfaction (e.g., feelings toward breast appearance) significantly

improved, whereas general body dissatisfaction (e.g., feelings of femininity) did not. These findings indicate that even though body dissatisfaction may improve after an initial impact from surgery for some survivors, it may not reach the pre-surgery level for quite some time, if at all. Similarly, other studies have found that during adjuvant treatment, at least 40% of survivors experience problems with sexuality, specifically sexual dysfunction (Biglia et al., 2010). Even six years post-treatment, nearly 50% or more of survivors can continue to experience the impact of treatment on their sexuality (Kedde et al., 2012; Ussher et al., 2012). Menopausal status prior to diagnosis may contribute to the long-term impact of treatment on dimensions of body image. Women who were premenopausal prior to diagnosis report more concerns related to body image, sexuality, and quality of life than women who were postmenopausal prior to diagnosis (Befort & Klemp, 2011). In general, levels of depression tend to improve within one year post-diagnosis, yet health-related quality of life continues to be affected, especially due to prolonged pain, fatigue, and insomnia (Biglia et al., 2010; Lee et al., 2011).

Other Correlates of Body Image and Sexuality

Demographics. Body image and sexuality can be impacted by breast cancer treatment regardless of age, but younger women under the age of 50 who are premenopausal have a particularly difficult time adjusting to treatment-related side effects, especially related to body image and sexuality, likely due to treatment-induced menopause. For example, Ganz et al. (2003) found that premenopausal women had elevated levels of depressive symptoms and disturbances with social and emotional functioning, and were also more likely to report sexual dysfunction after treatment compared to postmenopausal women. A recent study by Befort and Klemp (2011) found that rural women who were premenopausal at diagnosis reported more

negative changes in body image and social functioning, higher rates of menopausal symptoms, and a decrease in sexual desire compared to women who were postmenopausal at diagnosis.

There is little evidence that marital status impacts body image and sexuality in breast cancer survivors (e.g., Oudsten, Steeg, Roukema, & Vries, 2012). In the general population, a recent study including nearly 4,000 healthy, female participants found that after controlling for age and current weight, married or divorced women were more likely than single women to describe themselves as being overweight (Klos & Sobal, 2013). Thus, it is possible that women who are married or divorced have higher body dissatisfaction than women who have not married.

Because of the homogeneity of study samples, there is little known about whether education level impacts body image and sexuality. Most of the research has been done evaluating race on body image and sexuality rather than education level in healthy samples (Hunter & Befort, 2013). Generally, evidence supports African American women as having the lowest body dissatisfaction and Latinas having similar levels of body dissatisfaction as European Americans (Grabe & Hyde, 2006; Miller et al., 2000). There is limited evidence that Asian American women have similar levels of body dissatisfaction as African American women (Akan & Grilo, 1995), but the majority of findings indicate that Asian American women have equivalent levels or increased levels of body dissatisfaction as compared to European American women (Forbes & Frederick, 2008). A meta-analysis provided evidence that most ethnic differences related to body dissatisfaction are small, especially when controlling for BMI (Grabe & Hyde, 2006). In terms of factors related to sexuality, very little research is available. One study found that in women between the ages of 42-52, African American women reported the highest frequency of sexual activity, Hispanic women reported the lowest levels of sexual pleasure and arousal, and Asian American women reported the lowest levels of sexual desire (Avis et al., 2005). One study found

that sexual dysfunction occurs at equally low rates across all ethnicities, but those results have not been replicated (Laumann, Paik, & Rosen, 1999).

Emotional distress. The construct of body image has strong correlations with measures of emotional distress (Cash & Pruzinsky, 2002; Michael, Kawachi, Berkman, Holmes, & Colditz, 2000; White, 2000). One study in particular found that feeling less attractive, feeling less feminine, and having difficulty looking at the self naked were strongly related to depressive symptoms with correlations of r = .63, .56, and .59, respectively (Begovic-Juhant et al., 2012). Similarly, body integrity (e.g., "When something goes wrong inside your body, you're never really the same person again") is associated with elevated emotional distress (Carver et al., 1998; Petronis et al., 2003). When a perceived change in body functioning is experienced, having a concern with this change in body integrity causes feelings of body dissatisfaction, leading to emotional distress (Petronis et al., 2003).

Moreira and Canavarro (2012) compared body image emotions and their associations with factors of psychological adjustment across newly diagnosed patients prior to treatment and long-term breast cancer survivors. Body image emotions were measured with a self-consciousness scale, the Portuguese version of the 24-item Derriford Appearance Scale (Carr, Moss, & Harris, 2005). Items reflect feeling rejected, feeling distressed at social events, avoiding undressing with partner, and feeling distress at one's own reflection. Results indicated that the newly diagnosed survivors and long-term survivors experienced similar levels of body image emotions, with higher levels of these emotions contributing to higher levels of depressive symptoms.

Sexuality outcomes such as sexual arousal, sexual interest, and frequency of sexual activity have a bidirectional relationship with depression, with individuals experiencing

depressive symptoms at a 50-70% increased risk of developing problems with sexuality, and individuals experiencing problems with sexuality at a 130-210% increased risk of developing depression (Atlantis & Sullivan, 2012; Henson, 2002; Speer et al., 2005). Additionally, individuals experiencing depressive symptoms are 5.3 times more likely to report low sexual desire (Johnson, Phelps, & Cottler, 2004). Often times, women experience distress specifically related to pain during sexual intercourse, especially if they have problems with vaginal dryness due to menopause (Monga, 1995). This distress can prevent women from becoming aroused or feeling satisfied with the quality of their sexual relationship. Sexual problems and these emotional consequences can continue long into survivorship, even in women who have had lumpectomies or reconstructive surgery (Rowland et al., 2009).

Quality of life. Some studies show an association between dimensions of body image and quality of life constructs such as physical functioning, emotional functioning, cognitive functioning, and social functioning (Bloom, Stewart, Oakley-Girvan, Banks, & Shema, 2012; Koch et al., 2013; Lam et al., 2012; Montazeri, 2008). However, many studies do not investigate the association between body image and quality of life given that one or two items measuring body image are often included within the quality of life measure (e.g., DiSipio, Hayes, Battistutta, Newman, & Janda, 2011; Parker et al., 2007). Avis, Crawford, and Manuel (2005) aimed to identify predictors of quality of life among breast cancer survivors who were approximately three years post-diagnosis. The Functional Assessment of Cancer Therapy-Breast Cancer (FACT-B; Brady et al., 1997) was used to measure health-related quality of life, and includes the following subscales: Physical Well-Being (PWB; "I have a lack of energy"), Functional Well-Being (FWB; "I am able to enjoy life"), Emotional Well-Being (EWB; "I feel sad"), Social/Family Well-Being (SWB; "I get support from my friends"), and Breast Cancer-

Specific Concerns (BCS; asks questions regarding symptoms due to the disease and treatment and regarding psychological factors such as worry about the effect of stress on the disease). Single items from the CARES (Ganz et al., 1992) measured body discomfort and dissatisfaction, sexual interest, and sexual dysfunction. Body discomfort and dissatisfaction, experienced by 77.5% of the study sample, significantly predicted EWB, BCS, and FACT-B total score. Sexual interest did not significantly predict any of the quality of life domains, but sexual dysfunction did predict FWB. Additional evidence of the association between quality of life and body image comes from measure development research. The Appearance and Sexuality subscale of the Body Image and Relationships Scale (BIRS; Hormes et al., 2008), a scale created specifically to measure dimensions of body image in breast cancer survivors, was strongly associated with both the physical functioning and emotional functioning scales of the Medical Outcome Study, Short Form (SF-36; Ware, 1993) health-related quality of life scale with correlations of r = -.22 and -.63, respectively.

Body mass index. Higher BMI is associated with poorer body image, sexuality, and general quality of life including depression, social functioning, sexual functioning, and emotional functioning (Anandacoomarasamy et al., 2009; Befort, Austin, & Klemp, 2011; Collins et al., 2011). The strength of association between BMI and body image in breast cancer survivors is generally weak (r = .23), however, higher BMI and weight gain have been found to be predictive of poorer body image (Collins et al., 2011; Herman, Ganz, Petersen, & Greendale, 2005; Rosenberg et al., 2013). Falk Dahl et al. (2010) found that breast cancer survivors with a BMI over 27 kg/m^2 reported significantly poorer body image than women with a BMI less than 27 kg/m^2. Findings within the general population are similar; there is a weak to moderate association between BMI and body image (r = .25; Grossbard, Lee, Neighbors, & Larimer,

2009). However, this association tends to increase in strength when measurement focuses on weight and satisfaction with appearance. For example, van den Berg et al. (2007) measured body image with the Body Shape Satisfaction Scale (Pingatore, Spring, & Garfield, 1997), which evaluated satisfaction with ten aspects of body shape and parts. By focusing on satisfaction with shape and appearance, the association with BMI was moderately strong (r = .41). Less is known about the association between BMI and sexuality outcomes in breast cancer survivors, but research within the general population indicates that obese women are significantly more likely to experience problems with sexual dysfunction, sexual avoidance, and sexual satisfaction than women who are not obese (Shah, 2009). The strength of association between sexual dysfunction and BMI has been found to be as high as .72, with associations of .75, .66, .56 and .56 for arousal, lubrication, orgasm, and sexual satisfaction, respectively (Esposito et al., 2007).

Physical activity. Most of the evidence supporting an association between physical activity and dimensions of body image comes from weight loss or physical activity interventions, with an increase in physical activity related to an improvement in body image (Carraça et al., 2012; Pinto, Clark, Maruyama, & Feder, 2003; Speck et al., 2010). Outside of intervention studies, little evidence is available regarding the association between physical activity and dimensions of body image in breast cancer survivors and the general population. However, physical activity level has been found to significantly predict physical functioning and perceptions of strength, which is a dimension of body image in breast cancer survivors (Herman et al., 2005; Hormes et al., 2008). Physical activity level has also significantly predicted sexual dysfunction in a sample of postmenopausal healthy women, with 79% of sedentary, 67% of moderately active, and 58% of very active women experiencing sexual dysfunction (Cabral et al., 2013).

Causes of Weight Gain Following Treatment

Weight loss has become a popular topic within breast cancer survivorship given the risk for weight gain following treatment and the potential impact of lowering the risk of recurrence and other serious health events such as heart attack or stroke with weight loss. As previously mentioned, weight gain is common after diagnosis and treatment, with younger women and women who receive chemotherapy to be particularly at risk (Caan et al., 2005; Saquib et al., 2007). This weight gain is attributed to physiological changes and changes in behavior as a result of treatment.

Treatment-induced menopause. For younger women who have not yet gone through menopause, chemotherapy in addition to systemic anti-hormone therapies can produce physiologic changes that leads to a deficiency in estrogen resulting in premature menopause (Ganz et al., 1999). Vaginal dryness, hot flashes, decreased sex drive, in addition to weight gain, are all common side effects (Ganz, 2001c; Schover, 1991). Once women enter into menopause, there is an increase in adipose tissue accumulation and alterations in its distribution throughout the body (Del Rio et al., 2002). Goodwin et al. (1999) found that at one year post-treatment, 84.1% of study participants gained weight, with an average weight gain of 2.5 kg in women who received chemotherapy, 1.3 kg in women who received Tamoxifen, and 0.6 kg in women who did not receive adjuvant treatment. Weight gain in women who received chemotherapy or Tamoxifen was significantly greater than weight at baseline. Women who received chemotherapy gained significantly more weight than women who received Tamoxifen and women who did not receive adjuvant treatment. Average weight gain for women who remained postmenopausal or premenopausal through treatment was 1.05 kg and 1.07 kg, respectively. Women who became postmenopausal as a result of treatment gained significantly more weight

than women whose menopausal status did not change, with an average weight gain of 2.65 kg. Women in all three menopausal status groups gained significantly more weight than zero.

Reduced physical activity. Breast cancer survivors who engage in approximately 2-3 hours/week of brisk walking have a 50% reduction in recurrence and all-cause mortality than inactive women (Sternfeld et al., 2009). Additionally, regular physical activity is the strongest predictor of weight maintenance (Holick et al., 2008; Irwin et al., 2008; Sternfeld et al., 2009). Even so, it is common for breast cancer survivors to become less physically active the year after diagnosis; within three years post-diagnosis, only 52% of survivors increased their activity levels (Irwin et al., 2004). Demark-Wahnefried et al. (2001) aimed to investigate other contributors to weight gain post-treatment besides adjuvant therapies. Participants were enrolled within three weeks of diagnosis and followed over one year. Information on treatment, body composition, dietary intake, and physical activity was collected. No changes were found over time for dietary intake. Physical activity levels significantly decreased during the first four weeks of treatment, then slowly increased over the following 44 weeks. Activity at one year follow-up still did not match pre-treatment levels, but was not significantly different. Women who were more active over the course of treatment and once treatment ended had stable percent body fat and fat mass over the course of the year, whereas women whose activity significantly decreased had an increase in percent body fat and fat mass.

Weight Loss Intervention Effects on Body Image and Sexuality

Weight loss intervention studies in overweight and obese healthy women have demonstrated improvements in body image and sexuality including satisfaction with appearance, preoccupation with looks, sex appeal, and strength (Carels et al., 2013; Latner, Ciao, Wendicke, Murakami, & Durso, 2013). One of the first studies to investigate body image as a result of a

weight loss intervention was by Werlinger, King, Clark, Pera, and Wincze (1997). Researchers assessed perceived changes in sexual activity (e.g., finding sex more feasible and comfortable, being more attractive to others, sexual assertiveness) and body image (e.g., body dissatisfaction, feeling more attractive to others) after an average of 31 weeks in a weight loss program. All participants were enrolled in the Miriam Hospital Weight Management Program, a rolling enrollment weight loss program for obese women (Clark, Abrams, Niaura, Eaton, & Rossi, 1991). Participants' length of participation in the program ranged from 11 to 91 weeks. The program consisted of one week of calorie monitoring, 12 weeks of a protein-shake restricted diet allowing for 420-800 kcal/day, 6 weeks gradually reintroducing other types of foods, and 7 weeks of a healthy diet including fruits and vegetables yet not exceeding 1200 kcal/day. Participants were medically-supervised, participated in weekly cognitive-behavioral treatment groups focusing on issues related to weight loss (e.g., goal setting, relapse prevention training, mindful eating), and attended 45-minute weekly exercise programs supervised by an exercise physiologist. The mean BMI at the start of the program was 42.7, and by 31 weeks, the mean BMI was 33.4. Participants were administered questionnaires during week 31 of the intervention and asked to complete the surveys retrospectively for their ratings prior to weight loss and after weight loss. The participants' ratings of their body image and sexuality after weight loss significantly improved compared to their retroactive perceptions of their body image and sexuality prior to weight loss. A majority of the women (53%) reported that their sexual activity increased after losing weight. While this study provides evidence of an improvement in body image and sexuality, the methodology is suspect due to the retrospective reports from participants. This study was also completed in a sample of very obese women who lost on

average 56 pounds, making it difficult to generalize to other women whose BMI is not quite as high, and to breast cancer survivors, specifically.

Martin Ginis, McEwan, Josse, and Phillips (2012) evaluated body image change as a result of a 16-week weight loss intervention in overweight and obese women. Researchers were specifically interested in whether an individual's perceived physical changes or actual physical changes due to weight loss predicted body image change. Assessments completed at baseline, week 8 and week 16. The exercise intervention involved 45-60 minutes of moderate intensity activity seven days per week with additional resistance exercise two days per week. During each physical activity session, participants wore an energy expenditure device to ensure they expended at least 250 kcal. The dietary intervention restricted kcal/day to 500 kcal below each participant's weight maintenance energy requirements, which was calculated by study staff. Participants were educated on nutrition and encouraged to eat well-balanced diets including fruits, vegetables, dairy and protein. Food diaries were submitted bi-weekly to monitor food and kcal intake. Actual physical changes were collected through measures of body composition, aerobic fitness, and muscular strength. Perceived physical changes were measured using the Physical Self-Description Questionnaire (PSDQ; Marsh, Richards, Johnson, & Roche, 1994), including questions regarding perceived fatness, perceived aerobic endurance, and perceived muscular strength. Body image was measured using the Body Areas Satisfaction Scale (BASS) and the Appearance Evaluation (AE) subscale from the MBSRQ (Cash, 2000). The BASS evaluates satisfaction with various body parts, and the AE evaluates overall satisfaction with physical appearance. Body image significantly improved over time, with perceived physical change accounting for the most variance in body image change while actual physical changes were not predictive of body image change. It is unclear whether there were improvements from

baseline to week 16 with the three measures of actual physical changes (body composition, aerobic fitness, and muscular strength), in addition to how much weight on average participants lost, because those results were not reported. The authors also did not report percent weight loss or change in BMI. While this study provides evidence that body image can improve after weight loss, it does not provide answers for more informative predictors of body image change, and ignores the dimension of sexuality completely.

Carels et al. (2013) conducted a 3-month weight loss intervention followed by a 6-month no-contact phase in overweight and obese healthy men and women. The "New Perspectives" condition learned about reducing unhealthy relationships with food, body dissatisfaction, and internalized weight bias, whereas the "Transforming Your Life" condition leaned about environmental modification and habit formation and disruption. Body image was measured using the Multidimensional Body Self-Relations Questionnaire (MBSRQ; Cash, 2000), which included subscales reflecting satisfaction with appearance, preoccupation with looks, satisfaction with particular body parts, and preoccupation with fat and weight. Upon completion of the intervention, participants experienced a 6.5% average weight loss, and no differences were found between treatment conditions. Satisfaction with particular body parts and preoccupation with fat and weight were the only subscales on the MBSRQ that significantly improved post-intervention. Unfortunately, it is unknown whether these improvements continued into maintenance because body image was only measured at baseline and post-intervention. Similar to the study by Martin Ginis et al. (2012), changes in sexuality outcomes were not measured.

Once weight loss is achieved, maintaining the lower weight is challenging and there is evidence of substantial regain over time, with regain rates near 33% (Jeffery et al., 2000; Wadden, 2004; Wing & Phelan, 2005). A meta-analysis found that regain is common, with most

participants within a 3-4% weight loss from their baseline weight at 24, 36, and 48 month follow-up after an initial weight loss near 10% of their baseline weight (Franz et al., 2007). A recent study by Latner et al. (2013) found that improvement in body image and sexuality can be maintained, but the improvement may be dependent upon minimal regain after weight loss. Overweight and obese men and women enrolled in a 6-month weight loss intervention followed by an 18-month maintenance intervention. Participants attended weekly in-person meetings focused on topics related to weight loss (e.g., self-monitoring food intake, mindful eating) for the first six months, and were randomized into a continuing care condition (met in-person) or a standard of care condition (received educational materials) during the 18-month maintenance intervention. Body dissatisfaction was measured by the Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) and sexual functioning was measured by the Sexual Life subscale of the Impact of Weight on Quality of Life-Lite Scale (IWQOL; Kolotkin & Crosby, 2002) across all time points (baseline, end of treatment, 6-month follow-up, 18-month follow-up). Average percent weight loss was 5% at the end of treatment, and average weight regain was 25% for both maintenance conditions at 18-month follow-up. Even considering regain, weight at 18-month follow-up remained significantly lower than weight at baseline. Both body dissatisfaction and sexual functioning significantly improved from baseline to the end of the weight loss phase, and remained stable through 18-month follow-up. No differences were found between treatment groups. However, there was a nonsignificant trend for body image and sexuality scores to worsen as time passed from the intervention. Even so, over one year post-weight loss, body image and sexuality were still significantly improved from baseline.

Attention is not necessarily being directed towards interventions to improve body image and sexuality in breast cancer survivors. A pilot study for the current trial found an improvement

in body image and sexuality following a 6-month weight loss intervention in rural breast cancer survivors (Befort et al., 2012). There are currently no studies evaluating body image and sexuality as a main outcome following a large-scale weight loss intervention in breast cancer survivors; most of the research simply evaluates quality of life as a whole. This is also true for weight maintenance; evidence is limited for whether existing improvements in body image and sexuality would be maintained after weight loss, and whether certain dimensions would be more heavily impacted than others. While the study by Latner et al. (2013) provides preliminary evidence that improvements in body image experienced after weight loss can be maintained for an additional year, the study was completed in a sample of healthy men and women, weight loss was relatively low, and the multi-dimensional nature of body image was not considered with the exception of sexual functioning. Little is known about changes in body image and sexuality during this potential period of regain, and little is known about whether a change in body image and sexuality after weight loss can be maintained or even be protective against weight regain over time in breast cancer survivors.

Physical Activity Intervention Effects on Body Image and Sexuality

Physical activity is not only an important component in weight loss and weight maintenance, but it also has a positive influence on body image and sexuality in both healthy and breast cancer populations (Donnelly et al., 2009; Schmitz et al., 2005; Speck, Courneya, Mâsse, Duval, & Schmitz, 2010; Voskuil et al., 2010). A recent meta-analysis found that the effect of a strength training intervention in breast cancer survivors had a significant effect on body image, with a weighted mean effect size of -.26 (p = .03), indicating a small effect (Speck et al., 2010). In contrast, an earlier meta-analysis found a large weighted mean effect size of 1.21 (p = .03) for moderate intensity physical activity on body dissatisfaction (Schmitz et al., 2005). A 12-week

aerobic activity intervention in breast cancer survivors increased moderate intensity activity to three days per week, with 50 minutes of activity each day, building up to a goal of exercising within 60-70% of peak heart rate (Pinto et al., 2003). Body image was measured using the Body Esteem Scale (Franzoi & Shields, 1998), which includes Sexual Attractiveness (items related to sex drive), Physical Condition (items related to physical stamina and muscular strength) and Weight Concerns (items related to appetite, body build, and weight) subscales. Results after the 12-week intervention were compared between the intervention group and a control group, who were simply told not to change their current level of physical activity. There were no differences in the Sexual Attractiveness subscale between groups post-intervention, but there were significant differences in the Physical Condition and Weight Concerns subscales. The Physical Condition and Weight Concerns subscales also significantly improved from baseline to post-intervention for participants in the exercise condition.

Speck et al. (2010) conducted a one-year strength training intervention for breast cancer survivors with and without lymphedema, a painful swelling of the arm and/or hand due to blockages in the lymphatic system, to evaluate improvements in body image. Women engaged in strength training twice a week for approximately 90 minutes each time and completed upper body exercises such as seated row and bicep curls and lower body exercises such as leg press and leg curl. Body image was measured with the BIRS, consisting of the subscales Strength and Health, Social Barriers, and Appearance and Sexuality (Hormes et al., 2008). Regardless of lymphedema status, body image significantly improved after the intervention with a 12% improvement in BIRS total score, 14.9% improvement in Strength and Health, and a 7.3% improvement in Appearance and Sexuality. The only BIRS subscale that did not significantly change was Social Barriers, yet there was still a 5.5% improvement from baseline. Evidence

from these physical activity interventions in breast cancer survivors suggests that increasing activity alone, whether aerobic activity or strength training, can improve dimensions of body image. However, it is unclear whether these improvements are long-lasting.

The Rural Breast Cancer Population

Rural breast cancer survivors represent one of the most understudied groups of breast cancer survivors (Bettencourt, Schlegel, Talley, & Molix, 2007), even though approximately 20% of women in the U.S. live in a rural area (United States Census Bureau, 2000). Compared to urban women, rural women are less likely to have breast-conserving surgery and receive state-of-the-art-treatment (Haggstrom, 2005; Hershman, 2006; Howe, Katterhagen, Yates, & Lehnherr, 1992), more likely to be diagnosed at advanced stages (Monroe, Ricketts, & Savitz, 1992), and more likely to be obese, exercise less, and have less nutritional diets (Eberhardt, Ingram, & Makuc, 2001). Given these factors, body image and sexuality may be a major concern for rural survivors. In fact, a needs assessment survey administered to rural breast cancer survivors indicated that of those women who responded, 31% reported a change in body image and 39% reported diminished physical strength since cancer treatment (Befort et al., 2011). Preliminary findings in a pilot weight loss intervention conducted with rural breast cancer survivors indicated that weight loss was associated with improvements in body image and sexuality (Befort et al., 2012).

Summary

Breast cancer treatments, including surgery and adjuvant therapies, often have deleterious consequences on body image and sexuality (Montazeri, 2008). Rural women are at a heightened risk for suffering from impaired body image and sexuality due to higher rates of obesity and treatment-related side effects (Eberhardt et al., 2001; Hershman, 2006). More research is needed

within rural breast cancer survivors, specifically, to identify dimensions of body image that are of particular importance. Limited evidence indicates that weight loss improves various dimensions of body image and sexuality (Befort et al., 2012), but little is known about whether that improvement is maintained over time, especially if regain is experienced. More research is needed to better understand predictors of the multi-dimensional construct of body image, to understand how these constructs change with weight loss, to determine whether improvements in dimensions of body image are maintained over time, and whether these improvements are protective against regain.

The Present Study

This study was designed to address these unanswered questions by evaluating the multi-dimensional construct of body image longitudinally over the course of a weight loss and weight maintenance intervention in rural breast cancer survivors. This study examined various predictors of body image change after a weight loss intervention (baseline to 6-months) and weight maintenance intervention (6- to 18-months) and examined the protective effect an improvement in body image may have had on regain during the maintenance intervention.

Research Aims and Hypotheses

The following aims were considered during the weight loss and weight maintenance phase of the intervention.

Weight loss phase (baseline to 6-months).

Aim 1. Examine changes in multi-dimensional constructs of body image during a weight loss intervention from baseline to 6-months. Given evidence from previous literature, it was expected that general body image scores would

improve. However, there is little evidence available on whether the multi-dimensional subscales would improve.

Aim 2. Examine correlates of body image change at 6-months. Predictor variables included the following baseline variables: age, marital status, education level, time since treatment, surgery type, whether or not adjuvant therapy was received, BMI, depressive symptoms, and quality of life. Six-month change predictor variables included physical activity change from baseline to 6-months and percent weight loss. Examine correlates separately for each body image subscale and total body image score.

Maintenance phase (6- to 18-months).

Aim 3. Examine whether body image changes differ between maintenance treatment condition (i.e., phone vs. newsletter) during the weight maintenance intervention. Body image scores at 6-months were compared with scores at 18-months and compared across treatment conditions.

Aim 4. Examine correlates for changes in body image dimensions from 6- to 18-months. Predictor variables included the following baseline variables: age, marital status, education level, time since treatment, surgery type, whether or not adjuvant therapy was received, BMI, depressive symptoms, and quality of life. Eighteen-month predictor variables included maintenance treatment condition, physical activity change from 6- to 18-months, and percent weight regain. Correlates were examined separately for each body image subscale and total body image score.

Body image change predicting weight regain.

Aim 5. Examine whether changes in the various dimensions of body image from baseline to 6-months predicted weight regain at 18-months.

Methods

The study was part of a weight loss and maintenance randomized controlled trial in rural breast cancer survivors investigating the impact of a maintenance intervention on weight regain, sustained improvements in quality of life after weight loss, and the impact of weight loss on various breast cancer risk biomarkers (NIH grant 5R01CA155014-02). A flow chart of study design and procedures is included in Appendix A. Overweight and obese rural breast cancer survivors (n = 210) were recruited in eight cohorts. The intervention consisted of a 6-month weight loss intervention, followed by a 12-month randomized phase of two groups (phone vs. newsletter) weight maintenance intervention, and finally a 6-month transition to self-reliance phase for a total of two years. Randomization was stratified based on whether the participant was on anti-hormone therapy at baseline. Randomization was blinded to study staff and participants until 6-month data collection was completed. The study goal for each participant was a 5-10% weight loss from baseline weight. Not only has this weight loss been attainable as evidenced by previous weight loss interventions (e.g., Befort et al., 2012), but a 5-10% weight loss is also associated with a number of health benefits, including a reduction in risk of recurrence (Chlebowski et al., 2006; Fabian et al., 2010; Pierce et al., 2007). Data were collected at five time points, including baseline, 6-months, 12-months, 18-months, and 24-months.

Participants

Participants were 128 postmenopausal rural breast cancer survivors (age range 36.9-75.4 years old) from the first five of eight cohorts recruited from the following sites: Salina Regional

Medical Center, Salina, KS; Hays Medical Center, Hays, KS; Mercy Medical Center, Des Moines, IA; Good Samaritan Hospital, Kearney, NE; Saint Francis Medical Center, Grand Island, NE. Eligible participants included female breast cancer survivors with a BMI between 27-45 kg/m^2 who were diagnosed with Stage 0-IIIc disease within the past 10 years and completed local or systemic treatment within three months prior to starting the program. All women had clearance from their oncologist or medical provider. Women lived in rural areas as defined by Rural-Urban Commuting Area (RUCA) Codes (Office of Rural Health Policy, 2010), had access to a phone, and were able to walk briskly unassisted without serious medical risk. Women who participated in a formal weight loss program or took medication for weight loss six months prior to enrollment were ineligible. Women were weight-stable (i.e., did not gain or lose 10 pounds or more within three months of enrollment). Participants were also ineligible if they screened positive for substance abuse, major depression, or binge eating disorder.

Intervention

Phase I: Weight loss intervention. The weight loss intervention consisted of weekly phone-based group conference calls. The groups met once a week at different times with the same group leader, with approximately 10-15 participants per group and 20-30 total participants per cohort. During the first six months of the study, participants were instructed to follow a low-calorie diet (between 1200-1500 k/cal), eat five or more servings of fruits and vegetables per day, drink two whey-based protein shakes per day that were provided by the program, and eat two prepackaged frozen entrees per day (less than 350 k/cal and less than 9 g of fat). Physical activity was introduced during the second week of the program, and participants were instructed to gradually increase their moderate-intensity physical activity from 45 minutes per week (e.g., 15 minutes, three days per week) to 225 minutes per week (e.g., 45 minutes, five days per week).

Participants used self-monitoring strategies to report weekly intake of fruits, vegetables, prepackages entrees, shakes, unplanned snacks, meals out, number of steps (measured with a pedometer provided by the study) and self-reported minutes of planned physical activity, in addition to a week-long monthly food log to monitor calorie intake. The group leader for each cohort reviewed weekly data and provided feedback to participants individually and during the phone-based conference calls. The conference calls occurred weekly and lasted one hour. Structure included a general check-in about the participant's week, a review of self-monitoring group data averages, and education related to the week's topic. Topics included education related to nutrition, physical activity, and psychosocial issues such as cravings, body image, and eating at social gatherings. A list of session topics for the weight loss intervention is included in Appendix B.

Phase II: Weight maintenance intervention. Upon completing the weight loss phase, study staff and participants were unblinded to group assignment, with one group continuing with phone-based group conference calls and the other group assigned to a mail-based education comparison condition. Phone calls occurred bi-weekly rather than weekly, and newsletters were received on a bi-weekly basis by the comparison group as well, with both groups receiving the same information for that particular week. Participants could continue losing weight if they desired. The diet plan became less structured and allowed for participants to prepare healthy meals for themselves. They were encouraged to drink one whey-based protein shake and to eat one frozen prepackaged entrée per day. Participants were instructed to continue their moderate intensity physical activity level goal of at least 225 minutes per week. Self-monitoring continued with weekly data forms and monthly food logs. Topics covered in the phone calls and newsletters again focused on nutrition, exercise, and psychosocial issues, but new concepts were

introduced such as general principles from acceptance and commitment therapy (ACT; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). The social problem solving model (D'Zurilla & Goldfried, 1971) was introduced during the first maintenance session and practiced with real problems shared by participants during each maintenance phone call thereafter. Participants were directed to consider all steps of the problem-solving process, including 1) adopt a positive orientation that the problem is solvable, 2) gather all facts to define the problem, 3) review all possible solutions without judgment, 4) evaluate which solutions could realistically be employed to achieve the goal, 5) consider obstacles, and 6) carry out and re-evaluate the plan if necessary. A list of session topics for the weight maintenance phase is included in Appendix C.

Body image. The weight loss and weight maintenance interventions targeted body image not only indirectly through weight loss and physical activity, but also directly through session topics, session activities, and participant sharing. For example, the participants were able to discuss their breast cancer treatment histories and share stories, concerns, and triumphs related to surgery, adjuvant treatment, and the psychological and emotional impact of treatments. This sharing likely provided a sense of normalcy and validation, especially for rural women who generally have less exposure to other breast cancer survivors or survivorship care (Burris & Andrykowski, 2009).

During the weight loss phase, two sessions focused on dimensions of body image, including the sessions entitled, “How Do You See Yourself?” and “Managing Menopausal Symptoms.” “How Do You See Yourself?” provided an introduction to body image and to CBT principles such as automatic negative thoughts and the inter-relationships between thoughts, emotions, and behaviors. Participants were provided with example scenarios and asked to participate in an activity to identify how a thought related to their own body image can influence their emotions

and behaviors. For example, if a participant had the thought "I still don't look as good as I'd like to," the facilitator inquired about subsequent thoughts participants would have, how those thoughts make them feel, and the behavioral consequences of the thoughts. Participants provided examples of times they experienced negative thoughts related to their body image, and the group identified ways to think more realistically about given scenarios that trigger negative thinking. The second session focusing on a dimension of body image during the weight loss intervention, "Managing Menopausal Symptoms," was conducted by a guest speaker, typically a nurse practitioner from the cancer center who specialized in women's health and sexuality issues. During this session, the group leader highlighted that all participants in the study were postmenopausal, and that many of the issues to be discussed during the session are common not only of breast cancer survivors, but also of any woman going through menopause. This information was meant to establish a sense of safety for the participants to receive the information openly and to feel more comfortable asking questions. Session content focused on menopausal symptoms such as hot flashes, urinary incontinence, and vaginal dryness, and provided discussion about ways to manage the symptoms pharmacologically or through behavioral strategies.

During the weight maintenance phase, one session entitled "Building a Beautiful Body Image" was focused on dimensions of body image. This session reinforced principles from the first body image session during the weight loss phase ("How Do You See Yourself?"), and also discussed factors influencing sexuality and intimacy. For example, the session handouts described a number of ways that sexuality and intimacy can be affected by breast cancer treatment (e.g., surgery, menopausal symptoms), and provided information regarding an expanded view of intimacy. For example, it was suggested that some individuals may feel

intimate with their partner by emotional closeness or forms of physical touch such as holding hands or hugging, and that their meaning of intimacy may evolve over the course of their lifetime.

Two body image activities were utilized over the course of the study. For the first entitled "Picture Yourself Happy," the participants were asked to bring a photo that represented a time in their life when they were the happiest to the scheduled phone call for them to reference. The group leader facilitated conversation amongst the group members by asking them to describe the photo and why they felt so happy during that time in their life. Participants at first focused on what their physical bodies looked like at that time (e.g., "I was skinny!"), but were able to evolve into describing qualities that they value about themselves, such as "empowered," "confident," and "hilarious." These exercises allowed participants to connect and recognize the qualities that they truly value about themselves. The second body image activity was a mirror exercise that participants completed outside of the group phone calls. Participants were encouraged to reflect on five positive statements about their appearance and five positive statements about their personality. Not only did this exercise provide mirror-exposure to reduce avoidance of their reflection, but also allowed them to gain perspective on the qualities they value based on both physical appearance and personality.

Measures

Data specific to this study were collected at baseline, 6-months, and 18-months at the rural recruitment sites. On the morning of their assigned testing times, participants completed a number of in-person and computer-based questionnaires and had their height and weight measurements taken.

BMI, weight loss and weight regain. Baseline BMI was calculated at the testing site after taking at least two measurements each of weight and height, with height measured with a stadiometer. The study staff member taking measurements of weight and height was trained and verified for consistency during study training sessions prior to the study start date. Weight loss percent was calculated as weight loss at 6-months (lbs) divided by baseline weight (lbs), multiplied by ten. Weight regain percent was calculated as weight loss (or gain) between 6- and 18-months (lbs) divided by weight loss at 6-months (lbs), multiplied by one hundred.

Physical activity. Given the inconsistencies between self-report and objective measures of physical activity (Prince et al., 2008), all participants wore an Actigraph Accelerometer (Fort Walton Beach, FL) for seven consecutive days following each testing visit to gather objective physical activity data. Accelerometers provide information about physical activity engaged in throughout the day, including intensity level. For example, the accelerometer can measure the difference between taking a leisurely walk and jogging for an extended amount of time. The data collection interval was set at one minute with a minimum of 12 hours indicating a valid day. Data in counts per minute were downloaded and number of minutes per week in light activity were calculated using the cut-point of ≥760 counts/minute and ≥1952 counts/minute for moderate to vigorous activity suggested by Matthews, Ainsworth, Thompson, and Bassett (2002). A physical activity change score was created for activity change from baseline to 6-months and from 6-months to 18-months.

Body image and sexuality. The Body Image and Relationships Scale (BIRS; Hormes et al., 2008) is the only multi-dimensional measure of body image created specifically for breast cancer survivors. The BIRS included 32 items, each item ranked on a five-point Likert scale. Three subscales were originally proposed, including Strength and Health, Social Barriers, and

Appearance and Sexuality. Factor loadings across the three subscales were heterogeneous and as low as 0.28 (Appearance and Sexuality). Given that the BIRS was a relatively new measure, had limited evidence available regarding its factor structure, and had not been tested or validated in rural breast cancer survivors, its structure was evaluated for the purposes of this study. Using baseline data from the complete weight control trial (n = 210), an exploratory factor analysis (EFA) using Varimax rotation was completed. Assessment was conducted at baseline, one week prior to starting the intervention. A three-factor structure was only supported with eigenvalues exceeding two. The scree plot did not support a clear-cut three-factor model. Factors achieving an eigenvalue ≥1 were retained. Only items that loaded ≥0.40 on one factor were assigned to that factor. Factor analysis first supported a seven-factor structure. However, Factor 7 was comprised of three items focusing on hot flashes ("I was embarrassed by my hot flashes," "I restricted my social activities because of my hot flashes," and "Hot flashes prevented me from doing things I wanted to do"), which also loaded high on Factor 1 (Changes in Social Activities). By combining the three items into Factor 1, a six-factor structure was supported. Factor loadings are included in Appendix D. Due to low loadings or high cross-loading on other factors, two items were omitted from the scale ("Being out of shape prevented me from doing things I wanted to do" and "I was embarrassed by changes in my physical appearance that I attribute to my breast cancer surgery"). The total variance explained by Factor 1 (Changes in Social Activities; 9 items; e.g., "I restricted my social activities because of my hot flashes"), Factor 2 (Energy and Strength; 7 items; e.g., "My lack of energy prevented me from doing things I wanted to do"), Factor 3 (Discomfort or Embarrassment due to Appearance; 5 items; e.g., "I felt uncomfortable or embarrassed because I was out of shape"), Factor 4 (Body Integrity; 3 items; e.g., "My body felt whole to me"), Factor 5 (Sense of Control; 3 items; e.g., "The things that determined my health felt beyond my

control"), and Factor 6 (Sexuality; 3 items; e.g., "I have felt sexually attractive") was 24.4%, 15.9%, 8.4%, 6.4%, 6.3%, and 4.3%, respectively. Factor loadings were high and ranged from 0.49 (Sexuality) to 0.93 (Changes in Social Activities). The interfactor correlations ranged from 0.02 (Changes in Social Activities and Sense of Control) to 0.59 (Body Integrity and Sense of Control). Cronbach's alphas for the six factors were 0.88, 0.90, 0.69, 0.82, 0.64, and 0.48, respectively. Sense of Control and Sexuality were three-item scales, which contributed to the lower Cronbach's alphas. Mean body image scores were moderate for Changes in Social Activities (1.9), Sense of Control (2.2), and Sexuality (2.2), and moderately high for Energy and Strength (3.7), Discomfort or Embarrassment due to Appearance (3.6), Body Integrity (2.9), and Total Body Image Score (2.7) on a 5-point scale. While these findings were in contrast to the initial EFA results published for the BIRS, the six-factor structure was conceptually intuitive in representing the complex, multi-dimensional framework of body image, and was supported by EFA results. These six dimensions, in addition to BIRS total score, were considered in evaluating changes in body image after weight loss and weight maintenance.

Demographic and treatment information. Age, marital status, and education level was collected from participants at time of enrollment. Information on time since treatment, anti-hormone therapy status, surgery type, and adjuvant therapies (i.e., radiation and chemotherapy) was reported by the participant and verified by the participant's oncologist prior to baseline testing.

Depressive symptoms. The Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) is a brief, nine-item measure assessing criteria for a depressive episode. Participants were instructed to rate on a four-point Likert scale how much they had been bothered by various symptoms over a two-week period (0 = they were not bothered by the

symptom at all, 3 = they were bothered by the symptom nearly every day). Scores of 5, 10, 15 and 20 represented mild, moderate, moderately severe, and severe depression, respectively. A score ≥ 10 indicated a depressive episode. Internal reliability for the PHQ-9 was strong with a Cronbach's alpha of .89 in a primary care sample and .86 in a sample of obstetrics-gynecology patients. Higher PHQ-9 scores were strongly associated with deficits in quality of life, higher number of self-reported disability days, clinic visits, and symptom-related difficulties in activities and relationships, indicating high construct validity.

Quality of life. The Short-Form-12 Health Survey (SF-12; Ware, Kosinski, & Keller, 1996), an abbreviated version of the SF-36 (McHorney, Ware, & Raczek, 1993), is a measure of health-related quality of life. The SF-12 contained two composite scores, the Physical Health Composite Score (PCS-12) and the Mental Health Composite Score (MCS-12). The PCS-12 evaluated issues related to physical functioning, body pain, and vitality, whereas the MCS-12 evaluated social functioning, emotional functioning and general mental health. Participants were instructed to think about how they felt and how well they were able to complete usual activities over a four-week period. Most of the items in this 12-item measure included a five-point Likert scale (1 = the problem listed was always a concern, 5 = the problem listed was never a concern). Test-retest reliability was 0.89 and 0.76 for PCS-12 and MCS-12, respectively. These coefficients were comparable to test-retest reliability found in the original SF-36. In validity tests with various physical and mental functioning criteria, relative validity estimates ranged from 0.43 to 0.93 for the PCS-12 and 0.60 to 1.07 for the MCS-12 in relation to the SF-36, indicating strong validity.

Data Analysis

Data was entered and analyzed in SPSS 20.0 (SPSS, Chicago, IL). Analyses were done with all factors from the BIRS, including BIRS total score. With the exception of an expected improvement in body image upon completing the weight loss intervention, analyses were exploratory.

Aim 1: Evaluate body image changes from baseline to 6-months. Paired *t* tests were used to compare factor and total scores from baseline to 6-months. Effect sizes were calculated to determine clinical significance of the predicted improvements in body image.

Aim 2: Identify correlates and predictors of body image change from baseline to 6-months. Bivariate correlations were calculated between all body image change scores and predictors of body image change, including age, marital status, education level, time since treatment, surgery type, whether adjuvant therapy was received, baseline BMI, baseline depressive symptoms, baseline quality of life, weight loss percent at six months, and physical activity change from baseline to six months. Significant correlations found between body image dimensions and the predictor variables were considered in further multiple regression models to determine the combination of variables that predict change in body image from baseline to 6-months.

Aim 3: Evaluate the impact of treatment condition on body image change from 6- to 18-months. Bivariate correlations were run between BIRS change scores from baseline to 6-months and the respective BIRS scores at 18-months to determine whether the change score should be included as a covariate in a repeated-measures analysis of covariance (ANCOVA). A repeated-measures analysis of variance (ANOVA) was utilized given the non-significant relationship between BIRS change scores from baseline to 6-months and BIRS scores at 18-

months. This determined whether an interaction existed between maintenance treatment condition and time (i.e., 6-months and 18-months).

Aim 4: Identify correlates and predictors of body image change from 6- to 18-months. Bivariate correlations were calculated with baseline predictors of body image change including age, marital status, education level, BMI, time since treatment, surgery type, whether adjuvant therapy was received, depressive symptoms, and quality of life. Maintenance treatment condition, weight regain, and physical activity change from 6- to 18-months were also included. Significant correlations found between body image dimensions and the predictor variables were considered in further multiple regression models to determine the combination of variables that predicted change in body image from 6- to 18-months.

Aim 5: Evaluate whether body image change after the 6-month weight loss intervention is predictive of weight regain at 18-month follow-up. Bivariate correlations were calculated between weight regain at 18-months and the change scores calculated for body image from baseline to 6-months. The change score variable along with demographic (age, time since treatment, surgery type, and whether adjuvant treatment was received) and treatment (phone vs. newsletter) covariates were entered into a hierarchical regression model for any significant predictors of body image change to determine whether this change is predictive of weight regain at 18-months.

Results

Participant Characteristics

Participant characteristics are shown in Table 1. Among the 128 participants (M = 58.5 ± 7.8 years old), most women were white (n = 125, 97.7%), not Hispanic or Latino (n = 122, 95.3%), married (n = 108, 84.4%), with some college education (n = 52, 40.6%). Fifty-four

participants (42.2%) were diagnosed with stage I breast cancer and were an average of 3.7 ± 2.5 years from receiving active treatment. Sixty-five women (50.8%) underwent mastectomy, 56.1% (n = 69) of the women were currently taking anti-hormone therapy, and over 70% completed radiation (n = 90, 70.3%) and chemotherapy (n = 92, 71.9%).

Baseline measures and activity level are included in Table 2. Participants reported minimal depressive symptoms on the PHQ-9 (M = 3.5 ± 3.4, with a scale range from 0 to 15). Physical functioning (PCS; M = 48.2 ± 7.5) and mental functioning (MCS; M = 52.5 ± 7.9) on the SF-12 were consistent with national-level normative means (Ware, Kosinski, Turner-Bowker, & Gandek, 2002). Participants reported mild to moderate concerns with body image on each of the BIRS subscales in addition to BIRS total score (Total Body Image Score). On a 5-point Likert scale (i.e., BIRS subscale sum score divided by the number of items per respective subscale), Energy and Strength (M = 3.1 ± 0.8), Discomfort or Embarrassment due to Appearance (M = 3.6 ± 0.8), Body Integrity (M = 2.9 ± 0.9), and Sexuality (M = 3.1 ± 0.7), in addition to Total Body Image Score (M = 2.7 ± 0.6) had means above the scale midpoint of 2.5, indicating some body image concerns. Means for the respective subscales and total score are shown in Table 3. Participants were active at baseline, with light physical activity averaging 698.3 ± 228.5 minutes/week and moderate to vigorous physical activity averaging 219.5 ± 105.7 minutes/week.

Aim 1: Body Image Changes from Baseline to 6-Months

Weight, body image, and activity level descriptives from baseline to 6-months are shown in Table 2. Participants (n = 114, 89.1% of baseline sample) lost an average 13.6 ± 5.7% of their starting weight over the 6-month weight loss intervention, with a range weight loss of 3.8% to 24.9%. At 6-months, only Discomfort and Embarrassment due to Appearance and Sexuality had

Table 1

Demographic Characteristics (n=128)

	n (%)
Age (mean [SD])	58.5 (7.8)
BMI (mean [SD])	34.4 (4.3)
Race	
African American	1 (0.8)
Native American	1 (0.8)
White	125 (97.7)
Unknown	1 (0.8)
Ethnicity	
Hispanic or Latino	2 (1.6)
Not Hispanic or Latino	122 (95.3)
Unknown	4 (3.1)
Marital Status	
Single	3 (2.3)
Divorced/Separated	9 (7.0)
Widowed	5 (3.9)
Cohabitating	3 (2.3)
Married	108 (84.4)
Education Level	
High School/GED	32 (25.0)
Some College/Associate's Degree	52 (40.6)
Bachelor's Degree	25 (19.5)
Master's Degree	17 (13.3)
Doctoral Level Degree	2 (1.6)
Stage of Qualifying Diagnosis	
0/DCIS	11 (8.6)
I	54 (42.2)
II	42 (32.8)
III	21 (16.4)
Time Since Treatment (years; mean [SD])	3.7 (2.5)
Surgery Type	
Lumpectomy	63 (49.2)
Mastectomy	65 (50.8)
Antihormone Therapy Status	
Current Use	69 (56.1)
Past Use	35 (28.5)
No Use	41 (32.0)
Completed Radiation	90 (70.3)
Completed Chemotherapy	92 (71.9)

Table 2

Predictor and Outcome Measure Characteristics at Baseline and 6-Months (n=114)

	Baseline M (SD)	6-Months M (SD)
PHQ-9	3.5 (3.4)	
SF12-PCS	48.2 (7.5)	
SF12-MCS	52.5 (7.9)	
Percent weight loss		13.6 (5.7)
BIRS[a]		
Total Body Image Score	2.7 (.6)	2.0 (.5)
Changes in Social Activities	1.9 (.8)	1.5 (.6)
Energy & Strength	3.1 (.8)	2.1 (.7)
Discomfort/Embarrassment	3.6 (.8)	2.6 (.7)
Body Integrity	2.9 (.9)	2.1 (.8)
Sense of Control	2.2 (.6)	1.8 (.6)
Sexuality	3.1 (.7)	2.6 (.8)
Objective Activity		
Matthews min/week ≥760 ct/min[b]	698.3 (228.5)	802.4 (279.5)
Matthews min/week ≥1952 ct/min[c]	219.5 (105.8)	320.5 (164.2)

Note. [a]BIRS subscale sum score divided by number of items per respective subscale (5-point Likert scale) [b]Light physical activity [c]Moderate to vigorous physical activity

means over the scale midpoint of 2.5 ($M = 2.6 \pm 0.7$ and $M = 2.6 \pm 0.8$, respectively) on a 5-point Likert scale. Change scores for BIRS total score and the six subscales were calculated by subtracting the 6-months BIRS scores from the baseline BIRS scores, with positive scores indicating improvements in body image. The average change score for Total Body Image Score was 20.7 ± 15.9, and ranged from 1.2 ± 1.9 (Sense of Control) to 7.1 ± 6.1 (Energy and Strength) for the six subscales. Average light physical activity (counts/minute exceeding 760) was 802.4 ± 279.5 minutes/week, and moderate to vigorous physical activity (counts/minute exceeding 1952) averaged 320.5 ± 164.2 minutes/week at 6-months. Change scores for light- and moderate to vigorous-intensity physical activity were calculated by subtracting the minutes/week at baseline

from the minutes/week at 6-months, with positive values indicating an increase in activity. The average change scores for light- and moderate to vigorous-intensity activity were 102.1 ± 275.8 minutes/week and 100.7 ± 162.3 minutes/week, respectively.

Paired *t* tests were conducted to identify whether any significant differences exist between body image scores at baseline and 6-months. Results from paired *t* tests are shown in Table 3. All six subscales in addition to BIRS total score were significantly different (all *p*-values < .001), with average body image scores at 6-months lower than at baseline. Effect sizes ranged from moderate (*d* = 0.5, 0.6, and 0.6 for Changes in Social Activities, Sense of Control, and Sexuality, respectively) to large (*d* = 1.3, 1.4, 1.0, and 1.3 for Energy and Strength, Discomfort or Embarrassment due to Appearance, Body Integrity, and Total Body Image Score, respectively).

Table 3

Paired T Tests Comparing Changes in Body Image Dimensions from Baseline to 6-Months (n = 114)

	Baseline		6 Months			
	M	SD	M	SD	*t*	*d*
Total Body Image Score	81.3	16.9	60.6	14.5	13.8*	1.3
Changes in Social Activities	16.7	6.9	13.7	5.5	5.5*	0.5
Energy & Strength	21.7	5.6	14.7	4.8	12.2*	1.3
Discomfort/Embarrassment	18.2	3.9	12.9	3.7	13.8*	1.4
Body Integrity	8.8	2.6	6.3	2.4	8.9*	1.0
Sense of Control	6.6	1.9	5.5	1.8	6.4*	0.6
Sexuality	9.3	2.2	7.9	2.3	7.5*	0.6

Note. *$p<.001$
d: Cohen's d effect size

Aim 2: Correlates and Predictors of Body Image Changes from Baseline to 6-Months

Tables 4 and 5 display bivariate relationships between body image change scores and predictor variables. There were few significant bivariate relationships, and those that were significant were small. One of the subscales (Discomfort or Embarrassment due to Appearance) was not significantly related to the predictor variables, and two other subscales (Changes in

Social Activities and Body Integrity) only had one significant predictor. Multiple regression models for the remaining three scales and Total Body Image Score are shown in Table 6.

Table 4

Bivariate Relationships for Continuous Predictor Variables and Body Image Change Scores from Baseline to 6-Months

	Total Body Image Score	Changes in Social Activities	Energy & Strength	Discomfort/ Embarrassment	Body Integrity	Sense of Control	Sexuality
Age	-0.18	-0.17	-0.25**	-0.01	0.02	-0.01	-0.12
Education level	-0.03	-0.01	-0.01	-0.03	-0.07	-0.14	0.09
Time since treatment[a]	0.03	-0.14	-0.05	0.09	0.07	0.08	0.36***
BMI (BL)	-0.01	-0.12	0.02	0.02	0.10	0.14	-0.04
PHQ-9 (BL)	0.17	0.04	0.13	0.15	0.09	0.31**	0.11
SF12 PCS (BL)	-0.18	-0.09	-0.23*	-0.08	-0.13	-0.13	0.02
SF12 MCS (BL)	-0.27**	-0.20*	-0.26**	-0.02	-0.11	-0.29**	-0.13
Percent weight loss	0.07	0.04	0.10	0.14	-0.06	-0.08	0.10
Change in light PA	0.22*	0.13	0.25*	0.07	0.13	0.17	0.08
Change in mod-vig PA	0.26*	0.09	0.30**	0.17	0.07	0.17	0.11

Note. *p<.05; **p<.01; ***p<.001

BL: baseline. PA: physical activity. Mod-vig: moderate to vigorous.

[a]Years since treatment ended.

Table 5

Bivariate Relationships for Categorical Predictor Variables and Body Image Change Scores from Baseline to 6-Months

	Total Body Image Score	Changes in Social Activities	Energy & Strength	Discomfort/ Embarrassment	Body Integrity	Sense of Control	Sexuality
	t M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)
Marital status	*0.9*	*0.6*	*0.5*	*1.6*	*1.2*	*0.04*	*-0.8*
Single	24.1 (13.9)	3.9 (4.2)	7.8 (5.4)	6.9 (3.3)	3.3 (2.8)	1.2 (1.3)	1.1 (2.4)
Married	20.1 (16.2)	2.9 (6.1)	7.0 (6.3)	5.1 (4.2)	2.4 (3.0)	1.2 (2.0)	1.5 (2.0)
Surgery Type	*1.0*	*0.5*	*-0.1*	*1.1*	*2.3**	*-0.2*	*1.7*
Lumpectomy	22.1 (17.2)	3.3 (5.5)	7.0 (6.2)	5.8 (4.8)	3.1 (3.2)	1.1 (1.9)	1.7 (1.8)
Mastectomy	19.2 (14.6)	2.7 (6.3)	7.1 (6.1)	4.9 (3.3)	1.9 (2.6)	1.2 (2.0)	1.1 (2.2)
Radiation	*-0.1*	*-0.5*	*-0.3*	*0.3*	*-0.8*	*1.0*	*-0.03*
None	20.5 (13.9)	2.6 (6.1)	6.8 (5.5)	5.5 (3.4)	2.1 (2.7)	1.5 (1.8)	1.4 (2.5)
Completed	20.7 (16.7)	3.2 (5.8)	7.2 (6.4)	5.3 (4.4)	2.6 (3.1)	1.1 (2.0)	1.4 (1.8)
Chemotherapy	*-0.9*	*-1.6*	*-1.4*	*-0.3*	*0.7*	*0.7*	*1.4*
None	18.6 (14.8)	1.7 (5.0)	5.8 (5.4)	5.1 (4.2)	2.8 (3.0)	1.4 (1.8)	1.8 (2.5)
Completed	21.5 (16.4)	3.6 (6.2)	7.6 (6.4)	5.4 (4.1)	2.4 (3.0)	1.1 (2.0)	1.3 (1.8)
AHT	*1.7*	*1.7*	*0.8*	*1.6*	*0.7*	*0.5*	*2.1**
None	23.4 (16.3)	4.1 (6.0)	7.5 (6.1)	5.9 (4.3)	2.7 (2.9)	1.3 (2.0)	1.9 (2.5)
Current use	18.2 (15.5)	2.2 (5.8)	6.6 (6.3)	4.7 (4.0)	2.3 (3.1)	1.1 (1.9)	1.1 (1.5)

Note. *p<.05. AHT: Anti-hormone therapy.

Table 6

Multiple Regression Models Predicting Changes in Body Image from Baseline to 6-Months

	Total Body Image Score					
	b	SE	β	*t*	95% CI	R^2
						0.14
SF12 MCS (BL)	-0.4	0.2	-0.2	-2.1*	(-0.8, -0.02)	
Change in light PA	0.02	0.01	0.3	1.4	(-0.01, 0.04)	
Change in mod-vig PA	-0.001	0.02	-0.01	-0.1	(-0.04, 0.04)	
	Energy & Strength					
	b	SE	β	*t*	95% CI	R^2
						0.25
Age	-0.2	0.1	-0.2	-2.1*	(-0.3, -0.01)	
SF12 PCS (BL)	-0.2	0.1	-0.3	-2.9**	(-0.4, -0.1)	
SF12 MCS (BL)	-0.2	0.1	-0.2	-2.0*	(-0.3, -0.01)	
Change in light PA	0.003	0.004	0.1	0.6	(-0.01, .01)	
Change in mod-vig PA	0.01	0.01	0.1	0.7	(-0.01, 0.02)	
	Sense of Control					
	b	SE	β	*t*	95% CI	R^2
						0.13
PHQ-9 (BL)	0.1	0.1	0.2	2.5*	(0.03, 0.2)	
SF12 MCS (BL)	-0.1	0.02	-0.2	-2.2*	(-0.1, -0.01)	
	Sexuality					
	b	SE	β	*t*	95% CI	R^2
						0.13
Time since treatment[a]	0.3	0.1	0.3	3.3***	(0.1, 0.4)	
Anti-hormone therapy[b]	-0.2	0.4	-0.1	-0.6	(-1.1, 0.6)	

Note. *$p<.05$; **$p<.01$; ***$p<.001$

BL: baseline. PA: physical activity. Mod-vig: moderate to vigorous *b*: unstandardized regression coefficient; SE: standard error; β: standardized regression coefficient; CI: confidence interval. [a]Years since treatment ended. [b]Current use of anti-hormone therapy. No use is the reference group.

Treatment-related variables predicted Sexuality ($t = 3.3$, $p < .001$), such that being further from treatment predicted greater improvements in feeling sexually attractive. Baseline mental functioning predicted changes in Total Body Image Score ($t = -2.1$, $p < .05$), Energy and Strength ($t = -2.0$, $p < .05$), and Sense of Control ($t = -2.2$, $p < .05$), with poorer mental functioning at baseline predicting greater improvements in various body image dimensions after the weight loss intervention. Similarly, baseline physical functioning predicted changes in Energy and Strength ($t = -2.9$, $p < .01$), such that poorer physical functioning at baseline predicted greater improvements in Energy and Strength from baseline to 6-months. Higher

depressive symptoms at baseline predicted greater improvements in Sense of Control ($t = 2.5$, $p < .05$). Age was the only significant demographic predictor, with younger women experiencing greater improvements in Energy and Strength ($t = -2.1$, $p < .05$). Light and moderate to vigorous physical activity were not significant multivariate predictors of body image change from baseline to 6-months, despite significant bivariate correlations with Total Body Image Score and Energy and Strength.

Aim 3: Body Image Changes from 6- to 18-Months

Predictor and outcome variables by treatment condition are shown in Table 7 for participants who completed the weight maintenance intervention. Participants (n = 96; 75.0% of baseline sample) did not differ on demographic or treatment-related factors across the newsletter and phone treatment conditions. Participants in each treatment condition also did not differ in response to the first 6 months of the study (i.e., weight loss intervention). Weight regain was not compared by maintenance treatment condition in this study because it is the primary outcome of the larger weight control trial currently in progress.

Percent weight regain and activity level at 18-months is provided in Table 8. Average weight regain was 36.4 ± 44.8% of the weight lost after the weight loss intervention, with a range weight regain of -91.4% (i.e., weight loss) to 173.5%. Change scores for BIRS total score and the six subscales were calculated by subtracting the 18-months BIRS scores from the 6-months BIRS scores, with negative scores indicating a worsening in body image. Collapsing across treatment conditions, the average change score for BIRS total score was -6.8 ± 13.5, and ranged from -0.3 ± 5.0 (Changes in Social Activities) to -2.4 ± 5.1 (Energy and Strength) for the six subscales. Average light physical activity was 650.6 ± 211.7 minutes/week, and moderate to vigorous physical activity averaged 249.9 ± 153.1 minutes/week at 18-months.

Table 7

Predictor and Outcome Variables at Baseline and 6-Months by Treatment Condition for Participants Completing the Randomized Phase

	Mail (n = 50)	Phone (n = 46)	
	M (SD)	M (SD)	*t*
Age	58.0 (7.1)	59.1 (9.1)	-0.7
BMI (BL)	34.8 (4.0)	33.9 (4.1)	1.1
Time since treatment[a]	3.9 (2.5)	3.3 (2.3)	1.1
PHQ-9 (BL)	3.4 (3.0)	3.4 (3.3)	0.1
SF12 PCS (BL)	49.1 (6.5)	46.7 (8.6)	1.5
SF12 MCS (BL)	50.8 (8.2)	54.0 (7.5)	-2.0
Percent weight loss	14.6 (5.8)	14.6 (4.1)	0.01
Light PA (≥760 ct/min)[b]	815.6 (298.0)	792.6 (263.7)	0.4
Mod-vig PA (≥1952 ct/min)[b]	337.1 (168.8)	321.1 (163.4)	0.4
Change in light PA[c]	74.6 (303.2)	150.2 (238.1)	-1.3
Change in mod-vig PA[c]	96.5 (172.4)	126.8 (155.8)	-0.8
BIRS (raw scores)[d]			
Total Body Image Score	58.5 (14.1)	60.1 (13.5)	-0.6
Changes in Social Activities	12.9 (4.9)	13.5 (5.4)	-0.6
Energy & Strength	14.1 (5.2)	14.8 (4.1)	-0.7
Discomfort/Embarrassment	12.5 (4.0)	12.4 (3.3)	0.2
Body Integrity	6.0 (2.0)	6.5 (2.7)	-0.9
Sense of Control	5.3 (1.6)	5.5 (1.7)	-0.5
Sexuality	8.1 (2.5)	7.5 (2.0)	1.3
BIRS (change scores)[e]			
Total Body Image Score	22.3 (18.7)	20.3 (11.8)	0.6
Changes in Social Activities	2.8 (6.6)	3.2 (5.0)	-0.4
Energy & Strength	8.1 (6.8)	6.6 (4.7)	1.2
Discomfort/Embarrassment	5.6 (4.8)	5.8 (3.2)	-0.3
Body Integrity	2.9 (2.9)	2.0 (3.3)	1.5
Sense of Control	1.2 (1.8)	1.3 (1.8)	-0.5
Sexuality	1.5 (2.4)	1.4 (1.7)	0.2
	Mail (n)	Phone (n)	χ^2
Marital status			0.04
Married	44	40	
Not married	6	6	
Education level			6.3
High school	9	16	
Some college	20	16	
Bachelor's degree	10	10	
Master's degree	9	4	
Doctoral level degree	2	0	
Surgery type			0.3
Lumpectomy	24	24	
Mastectomy	26	22	
Anti-hormone therapy			0.1
No use	22	18	
Current use	28	38	
Radiation			0.6
No	18	13	
Yes	32	33	

Chemotherapy			0.3
No	14	15	
Yes	36	31	

Note. BL: baseline. PA: physical activity. Mod-vig: moderate to vigorous.
[a]Years since treatment ended. [b]Physical activity at 6-months. [c]Change in physical activity from baseline to 6-months. [d]BIRS scores at 6-months. [e]BIRS change scores from baseline to 6-months.

Table 8

Weight Regain and Activity Level from 6- to 18-Months (n = 96)

	M (SD)
Percent weight regain	36.4 (44.8)
Accelerometer Activity	
Matthews min/week ≥760 ct/min[a]	650.6 (211.7)
Matthews min/week ≥1952 ct/min[b]	249.9 (153.1)

Note. [a]Light physical activity [b]Moderate to vigorous physical activity

Change scores for light and moderate to vigorous physical activity were calculated by subtracting the minutes/week at 6-months from the minutes/week at 18-months, with negative values indicating a decrease in activity. The average change scores for light and moderate to vigorous activity were -131.9 ± 234.3 minutes/week and -80.9 ± 131.4 minutes/week, respectively.

BIRS change scores from baseline to 6-months were unrelated to BIRS scores at 18-months, with nonsignificant bivariate correlations ranging from $r = 0.02$ (Body Integrity) to $r = -0.12$ (Sexuality). Therefore, BIRS change scores from baseline to 6-months were not included as covariates in subsequent analyses. A series of two-way repeated measures ANOVAs were conducted to determine whether any differences existed between maintenance treatment condition (i.e., newsletter vs. phone condition) and BIRS total score and subscales. Results from the ANOVAs are included in Table 9. The main effect of maintenance treatment condition was not significant for BIRS total score or any of the six subscales. However, the main effect of time (i.e., comparing BIRS scores at 6-months and 18-months) was significant for BIRS total score

and all subscales (all *p*-values < .05 and < .001) with the exception of Changes in Social Activities. In all cases, body image scores at 18-months were higher than scores at 6-months, indicating a worsening in body image with effect sizes ranging from small (partial $\eta^2 = 0.06$ and 0.07 for Body Integrity and Sexuality, respectively) to medium (partial $\eta^2 = 0.12$, 0.15, 0.17, and 0.18 for Sense of Control, Discomfort or Embarrassment due to Appearance, Energy and Strength, and Total Body Image Score, respectively). The interaction between time and maintenance treatment condition was significant only for Body Integrity (F (1, 94) = 4.4, $p < .05$, partial $\eta^2 = 0.05$). Specifically, Body Integrity scores in the newsletter condition worsened over time whereas scores for the phone group stayed relatively stable.

Table 9

Two-Way Repeated Measures ANOVAs Evaluating Changes in Body Image from 6- to 18-Months

	Mail (n=50)		Phone (n=46)		Time (6-18 months)		Time*Treatment Condition	
	6-months M (SD)	18-months M (SD)	6-months M (SD)	18-months M (SD)	F	partial η^2	F	partial η^2
Total Body Image Score	58.6 (2.0)	66.9 (2.4)	60.1 (2.0)	64.2 (2.5)	20.4**	0.18	2.3	0.02
Changes in Social Activities	13.0 (0.7)	13.1 (0.8)	13.5 (0.8)	14.0 (0.8)	0.4	0.01	0.1	0.001
Energy & Strength	14.2 (0.7)	17.2 (0.8)	14.8 (0.7)	16.3 (0.8)	18.4**	0.17	2.0	0.02
Discomfort/Embarrassment	12.5 (0.5)	14.8 (0.6)	12.3 (0.5)	13.2 (0.6)	16.3**	0.15	3.4	0.04
Body Integrity	6.0 (0.3)	7.1 (0.3)	6.5 (0.3)	6.6 (0.4)	6.4*	0.06	4.4*	0.05
Sense of Control	5.3 (0.2)	6.4 (0.3)	5.5 (0.2)	6.0 (0.3)	13.3**	0.12	1.4	0.01
Sexuality	8.1 (0.3)	8.6 (0.3)	7.5 (0.3)	8.1 (0.3)	6.6*	0.07	0.2	0.002

Note. *p<.05; **p<.001

Aim 4: Correlates and Predictors of Body Image Changes from 6- to 18-Months

Tables 10 and 11 display bivariate relationships between body image change scores and predictor variables. There were few significant bivariate relationships, and those that were significant were small. Exceptions to this include correlations between weight regain and Body Integrity (r = -0.26) and weight regain and Discomfort or Embarrassment due to Appearance (r = -0.38). Three scales (Total Body Image Score, Changes in Social Activities, and Sexuality) only had one significant predictor. Multiple regression models for the remaining four scales are shown in Table 12. Multiple regression models revealed that marital status predicted changes in Discomfort or Embarrassment due to Appearance (t = 2.0, p < .05) and Sense of Control (t = 2.1, p < .05). Specifically, being married predicted fewer negative changes in Discomfort or Embarrassment due to Appearance and Sense of Control from 6- to 18-months. Use of anti-hormone therapy also predicted changes in Discomfort or Embarrassment due to Appearance (t = 3.1, p < .01), with women currently taking anti-hormone therapy experiencing less negative change in Discomfort or Embarrassment due to Appearance. PHQ-9 scores at baseline predicted changes in Sense of Control (t = -2.1, p < .05), with higher levels of depressive symptoms at baseline predicting greater negative changes in Sense of Control from 6- to 18-months. Percent weight regain predicted changes in Energy and Strength (t = -2.5, p < .05), Discomfort and Embarrassment due to Appearance (t = -4.0, p < .001), and Body Integrity (t = -2.0, p < .05). Specifically, higher rates of weight regain predicted greater negative changes in the three subscales.

Table 10

Bivariate Relationships for Continuous Predictor Variables and Body Image Change Scores from 6- to 18-Months

	Total Body Image Score	Changes in Social Activities	Energy & Strength	Discomfort/ Embarrassment	Body Integrity	Sense of Control	Sexuality
Age	0.02	0.06	0.06	0.02	-0.11	-0.03	-0.03
Education level	0.02	-0.06	0.03	-0.01	0.12	0.04	0.02
Time since treatment[a]	0.07	-0.07	0.23*	0.05	0.02	0.05	-0.09
BMI (BL)	-0.09	-0.04	-0.11	0.01	-0.19	-0.10	0.08
PHQ-9 (BL)	-0.16	0.15	-0.18	-0.20*	-0.17	-0.20*	-0.17
SF12 PCS (BL)	0.15	0.21*	0.16	-0.04	0.01	0.11	0.02
SF12 MCS (BL)	0.14	-0.15	0.19	0.16	0.19	0.14	0.001
Percent weight regain	-0.30**	0.06	-0.27**	-0.38***	-0.26**	-0.19	-0.18
Change in light PA	0.04	-0.02	0.05	0.03	0.06	-0.05	0.25*
Change in mod-vig PA	0.02	0.04	0.07	-0.09	-0.00002	-0.13	0.19

Note. *$p<.05$; **$p<.01$; ***$p<.001$

BL: baseline. PA: Physical activity. Mod-vig: moderate to vigorous.

[a]Years since treatment ended.

Table 11

Bivariate Relationships for Categorical Predictor Variables and Body Image Change Scores from 6- to 18- Months

	Total Body Image Score	Changes in Social Activity	Energy & Strength	Discomfort/ Embarrassment	Body Integrity	Sense of Control	Sexuality
	t M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)	*t* M (SD)
Marital status	*-1.9*	*-1.1*	*-1.2*	*-2.1**	*-1.4*	*-2.1**	*0.9*
Single	-13.5 (10.8)	-1.7 (5.0)	-4.0 (5.7)	-3.7 (3.7)	-1.8 (1.8)	-2.2 (2.0)	-0.1 (2.1)
Married	-5.8 (13.6)	-0.1 (4.9)	-2.2 (5.0)	-1.4 (3.7)	-0.7 (2.7)	-0.8 (2.3)	-0.6 (1.9)
Surgery Type	*0.03*	*-0.9*	*1.5*	*-0.5*	*0.2*	*-0.3*	*-0.6*
Lumpectomy	-6.7 (12.4)	-0.8 (4.6)	-1.7 (5.1)	-1.9 (3.8)	-0.8 (2.5)	-1.1 (2.2)	-0.6 (1.8)
Mastectomy	-6.8 (14.6)	0.1 (5.3)	-3.1 (5.1)	-1.5 (3.8)	-0.9 (2.8)	-0.9 (2.4)	-0.4 (2.0)
Radiation	*0.7*	*0.4*	*-0.04*	*1.2*	*0.3*	*1.1*	*0.7*
None	-5.3 (12.1)	-0.1 (4.4)	-2.4 (4.3)	-1.0 (3.9)	-0.7 (2.6)	-0.6 (1.7)	-0.3 (2.1)
Completed	-7.4 (14.0)	-0.5 (5.2)	-2.4 (5.5)	-2.0 (3.7)	-0.9 (2.7)	-1.2 (2.5)	-0.6 (1.8)
Chemotherapy	*0.6*	*1.4*	*0.3*	*0.6*	*-0.7*	*0.5*	*-1.4*
None	-5.6 (13.9)	0.7 (5.2)	-2.2 (4.4)	-1.3 (4.1)	-1.1 (2.4)	-0.8 (2.0)	-0.9 (1.7)
Completed	-7.3 (13.3)	-0.8 (4.8)	-2.5 (5.4)	-1.8 (3.7)	-0.7 (2.7)	-1.1 (2.5)	-0.3 (2.0)
AHT	*-1.0*	*0.4*	*0.7*	*-3.0***	*-1.1*	*-0.9*	*-1.8*
None	-8.2 (13.1)	0.02 (4.6)	-1.9 (5.1)	-3.0 (3.8)	-1.2 (3.1)	-1.2 (2.7)	-0.9 (2.1)
Current use	-5.5 (13.6)	-0.4 (5.3)	-2.7 (5.2)	-0.7 (3.4)	-0.6 (2.3)	-0.8 (2.0)	-0.2 (1.8)
Treatment Condition	*-1.5*	*0.3*	*-1.4*	*-1.9*	*-2.1**	*-1.2*	*0.5*
Mail	-8.3 (15.2)	-0.2 (4.7)	-3.0 (5.8)	-2.3 (4.3)	-1.2 (2.5)	-1.1 (2.6)	-0.4 (2.3)
Phone	-4.1 (11.1)	-0.5 (4.8)	-1.5 (4.1)	-0.9 (3.1)	-0.1 (2.4)	-0.6 (1.8)	-0.6 (1.5)

Note. *$p<.05$; **$p<.01$. AHT: Anti-hormone therapy.

Table 12

Multiple Regression Models Predicting Changes in Body Image from 6- to 18-Months

	Energy & Strength					
	b	SE	β	*t*	95% CI	R^2
						0.10
Time since treatment[a]	0.4	0.2	0.2	1.7	(-0.05, 0.8)	
Percent weight regain	-0.03	0.01	-0.2	-2.5*	(-0.05, -0.01)	
	Discomfort/Embarrassment					
	b	SE	β	*t*	95% CI	R^2
						0.29
Marital status[b]	2.0	1.0	0.2	2.0*	(0.03, 3.9)	
Anti-hormone therapy[c]	2.1	0.7	0.3	3.1**	(0.7, 3.4)	
PHQ-9 (BL)	-0.2	0.1	-0.2	-1.7	(-0.4, 0.03)	
Percent weight regain	-0.03	0.01	-0.4	-4.0***	(-0.05, -0.02)	
	Body Integrity					
	b	SE	β	*t*	95% CI	R^2
						0.08
Treatment condition[d]	0.9	0.5	0.2	1.7	(-0.1, 1.9)	
Percent weight regain	-0.01	0.01	-0.2	-2.0*	(-0.03, 0.0001)	
	Sense of Control					
	b	SE	β	*t*	95% CI	R^2
						0.08
Marital status[b]	1.4	0.7	0.2	2.1*	(0.1, 2.7)	
PHQ-9 (BL)	-0.1	0.07	-0.2	-2.1*	(-0.3, -0.01)	

Note. *p<.05; **p<.01; ***p<.001

BL: baseline. *b*: unstandardized regression coefficient. SE: standard error. β: standardized regression coefficient. CI: confidence interval.

[a]Years since treatment ended. [b]Not married was the reference group. [c]Current use of anti-hormone medication. Not currently taking anti-hormone therapy was the reference group. [d]Mail condition was the reference group.

Aim 5: The Relationship between Body Image Changes from Baseline to 6-Months and Weight Regain

Bivariate correlations were calculated between weight regain at 18-months and the change scores for body image from baseline to 6-months after completion of the weight loss intervention. None of the baseline to 6-month change scores for the six subscales and BIRS total score predicted weight regain (correlation coefficients ranged from $r = 0.01$ with Sense of Control to 0.14 with Energy and Strength).

Discussion

The results of this study demonstrate the impact that a variety of demographic, treatment-related, and psychosocial factors have on body image dimensions in breast cancer survivors, with a particular focus on factors related to weight change and activity levels in the context of a weight control trial. Over the course of a weight loss intervention, all dimensions of body image improved, which is congruent with preliminary evidence that rural breast cancer survivors enrolled in a weight loss intervention experienced improvements in body image post-intervention (Befort et al., 2012).

Most studies have not investigated the association between changes in body image after weight loss and whether weight loss itself was predictive of that change. Weight loss and physical activity changes were less predictive of improvements in body image than age, breast cancer treatment history, baseline depressive symptoms, and quality of life. From 6- to 18-months, weight regain, marital status, breast cancer treatment history, and baseline depressive symptoms were predictive of negative changes in body image dimensions, leaving weight regain as the only intervention-related variable predictive of body image changes over the course of the study.

Unexpectedly, weight loss was not associated with any of the improvements in body image across dimensions. The lack of association may be due to the way body image was measured as a construct by the BIRS. As described by the CB model (Cash, 2011), of the three constructs defining body image, self-discrepancy, or the evaluative construct, tends to be most influenced by weight change and change in ideal body size (Palmeira et al., 2009) and is often measured using scales evaluating body size. However, another construct described by the CB model, investment in appearance (i.e., the importance placed on the discrepancy between the

actual-self and the ideal-self), tends to be more complex and is influenced by cognitive, affective, and behavioral factors and often highlights the concern or dissatisfaction one has with their body (Carraça et al., 2012). Carraça et al. (2012) evaluated whether outcomes of a weight loss intervention (i.e., percent weight loss and an increase in physical activity) impacted both the evaluative and investment constructs of body image in 225 healthy adult women (37.6 ± 7 years old) engaged in a one-year weight loss intervention. The evaluative construct was measured with the Figure Rating Scale (Stunkard, Sorensen, & Schulsinger, 1983), consisting of nine silhouettes of increasing body size that asks participants to identify their current and ideal body size. The investment construct was measured using the Body Shape Questionnaire (Cooper et al., 1987) and Social Physique Anxiety Scale (Hart, Rejeski, & Leary, 1989), both utilizing Likert scales and including questions such as, "Have you avoided wearing clothes that make you aware of your body?" and "Unattractive features of my physique make me nervous in certain social settings." After controlling for percent weight loss, changes in physical activity were only predictive of the investment construct and not the evaluative construct, with an increase in physical activity related to improvements in body image. Researchers concluded that the investment in appearance construct might be more influenced by physical activity and not weight loss itself. These results may relate to the findings of the present study, given that at the bivariate level, physical activity, regardless of the intensity level, was more closely related to improvements in body image than percent weight loss. This may be because the BIRS items reflect the thoughts, emotions, and behaviors that are representative of the investment in appearance construct of body image.

Regardless of intensity level, physical activity did not remain predictive of changes in body image dimensions at the multivariate level, a function of the shared variance between

physical activity and other predictors included in the models (e.g., quality of life). This result is in contrast with other findings describing an increase in physical activity related to improvements in body image even when weight remains unchanged (Pinto et al., 2003; Schmitz et al., 2009). It was especially surprising that changes in physical activity did not predict the dimension Energy and Strength, given that previous studies have found physical activity to predict physical functioning and perceptions of strength in breast cancer survivors (Herman et al., 2005; Hormes et al., 2008). It is possible that the true influence of physical activity was not observed due to the high levels of baseline physical activity, resulting in smaller change scores between time points. In a study done by Matthews et al. (2002), age-adjusted physical activity time in minutes per week for women averaged 190.7 for moderate to vigorous intensity (≥1952 counts/minute), compared to the 219.5 minutes per week found in this study. Despite the objective nature of accelerometry, it remains possible that participants' activity was subject to bias; by virtue of the participants being aware of the accelerometer monitoring their activity, they could have altered their activity accordingly (Montoya, Kemper, Saris, & Washburn, 1996).

As expected, weight regain was common, with an average regain of 36.4% in this sample. Percent weight regain in this study is similar to previous studies finding average regain of approximately 33% (Jeffery et al., 2000; Wadden, 2004; Wing & Phelan, 2005). Despite the two treatment modalities utilized during the weight maintenance intervention, body image scores across both conditions were significantly worse at 18-months compared to 6-months for all subscales except for Changes in Social Activities. Additionally, change scores did not differ by maintenance treatment condition except for Body Integrity. These findings compare to limited previous research by Latner et al. (2013), who found a steady, nonsignificant worsening trend in body image over the course of an 18-month weight maintenance intervention in 78 overweight

and obese men and women who lost approximately 5% of their baseline weight and experienced regain of approximately 25%. It is likely that the differences in findings are a result of a small sample size, a sample consisting of men and women without chronic health conditions, and minimal weight loss and weight regain. In a study utilizing a sample of 225 adult women, Carraça et al. (2012) found a significant deterioration in body image over the course of a one-year maintenance intervention subsequent to successful weight loss. However, body image upon completion of the maintenance intervention remained better than body image 24 months earlier at baseline. Similarly, in this study, given that the magnitude of change from baseline to 6-months (e.g., average change of Total Body Image Score from baseline to 6-months was 20.7) was far greater than the negative changes from 6- to 18-months (e.g., average change of Total Body Image Score from 6- to 18-months was -6.8), body image dimensions at 18-months were better than body image at baseline.

A number of variables were considered in the analyses, yet only eight were predictive of change in the various dimensions of body image at the multivariate level. Interestingly, being married appeared to protect women from experiencing greater worsening in body image change from 6- to 18-months, particularly related to Discomfort or Embarrassment due to Appearance and Sense of Control over health. These results may be related to evidence that married women tend to have better health outcomes, health-related quality of life, and emotional quality of life than their single counterparts (Inverso et al., 2014; Lillard & Panis, 1996; Michael, Berkman, Colditz, Holmes, & Kawachi, 2002; Parker, Baile, Moor, & Cohen, 2003). However, these findings should be interpreted with caution given the small comparison group of non-married participants in the study. Additionally, it is possible that the quality of marital relationships

contributed to changes in body image over the course of the weight loss and weight maintenance intervention. However, data on relationship quality was not collected.

Women with higher depressive symptoms and poorer physical functioning at baseline experienced the greatest improvements in body image from baseline to 6-months and the greatest worsening in body image from 6- to 18-months. The large improvement in body image dimensions after the weight loss intervention could be related to a reduction in depressive symptoms and improved physical functioning (Imayama et al., 2011; Travier et al., 2013). Therefore, these women had the greatest room for improvement in comparison to women who reported less depressive symptoms and had better physical functioning. Conversely, during the weight maintenance intervention, it is possible that women with higher baseline depressive symptoms and poorer physical functioning were especially vulnerable to the effects of weight regain, resulting in greater negative changes in body image dimensions. Research has not investigated whether baseline depression or physical functioning contributes to changes in body image dimensions during a weight maintenance intervention, and instead has focused on the impact of these constructs on weight regain itself. Overall, there is mixed evidence of the impact of these baseline variables on weight regain (Bidgood & Buckroyd, 2005; Collings, Saules, & Saad, 2008).

In contrast to what was expected, current anti-hormone medication use was predictive of experiencing fewer negative changes in Discomfort or Embarrassment due to Appearance after the weight maintenance intervention. It is possible that given the negative side effects women taking the medication have already experienced (i.e., weight gain, hot flashes, decreased sex drive), any negative experiences directly or indirectly related to weight regain during the maintenance intervention was blunted by their prior experiences, resulting in minimal changes in

Discomfort or Embarrassment due to Appearance. It was also surprising that current anti-hormone medication use was not predictive of changes in the Sexuality dimension at the multivariate level given evidence that menopausal symptoms caused by anti-hormone therapy contribute to sexual dysfunction and decreased sexual attractiveness (Ganz et al., 2004; Panjari et al., 2011). Instead, time since treatment remained a significant predictor of changes in Sexuality at the multivariate level. Women who were farther from cancer treatment may have been more likely to have completed their regimen of anti-hormone medication, thus contributing to shared variance between anti-hormone therapy status and time since treatment in the model.

While a number of factors were found to predict changes in body image during both interventions, the predictors had generally weak correlation coefficients. In fact, with the exception of two models, the percent of variance accounted for by the various models after weight loss and weight maintenance ranged from 8% (Body Integrity and Sense of Control from 6- to 18-months) to 14% (Total Body Image Score from baseline to 6-months). Given the small amount of variance accounted for by the models, there may be other factors contributing to body image change not accounted for by this study. One potential contributor may be related to self-efficacy. Self-efficacy is based on social cognitive theory, and refers to an individual's beliefs regarding their ability and competence to achieve goals and engage in behavior change (Strecher, DeVellis, Becker, & Rosenstock, 1986). Individuals with higher levels of self-efficacy tend to show greater effort and commitment to engaging in healthy behaviors (Shwarzer, 1992); however, self-efficacy can also be increased by successfully pursuing goals (Strecher et al., 1986).

There is evidence that the change in self-efficacy related to healthy eating and physical activity, rather than baseline self-efficacy for both behaviors, over the course of a weight loss

intervention is particularly important for predicting weight loss (Byrne, Barry, & Petry, 2012). Given the high percent weight loss from baseline to 6-months found for the current study, it is possible that the weight loss intervention had a direct effect on improving self-efficacy for diet and exercise, thereby influencing not only weight loss but also changes in body image. The exercise and self-esteem model (Sonstroem & Morgan, 1989) supports this hypothesis, given that improvements in exercise self-efficacy as a result of regular physical activity enhances body image. This improvement in body image is based on an individual's perception of physical fitness, even without objective improvements in fitness (Martin & Lichtenberger, 2002).

The possible improvement in self-efficacy may have impacted the participants' beliefs in their ability to modify their healthy behaviors and could have led to generalized improvements in their ability to cope with treatment effects from breast cancer (Hormes et al., 2008), as well as establish a sense of control over their health (Berterö, 2002). Kreitler, Peleg, and Ehrenfeld (2007) were interested in evaluating the influence of general self-efficacy for coping on quality of life in male and female cancer patients. Rather than focusing on self-efficacy of a specific health behavior, researchers measured general self-efficacy for modifying one's own cognitions, emotions, and behaviors in general (e.g., "I can always manage to solve difficult problems if I try hard enough" from the General Self-Efficacy Scale; Schwarzer & Jerusalem, 1995). Results indicated that individuals with higher general self-efficacy had better physical functioning, mental functioning, sense of control, sense of coping, and body image as measured by the Multidimensional Quality of Life Questionnaire (Kreitler & Kreitler, 2006) than those with lower levels of general self-efficacy. Thus, higher levels of self-efficacy resulting from the weight loss intervention in the current study, independent of the effect of percent weight loss or change in physical activity, could have contributed to the improvements in body image

dimensions from baseline to 6-months. Conversely, from 6- to 18-months, it appears that weight regain itself predicted a worsening in body image. Weight regain may have directly impacted both body image and self-efficacy, resulting in a sense of failure or disappointment that may have further perpetuated unhealthy behaviors associated with weight regain.

Another factor likely contributing to both weight regain and body image change is weight history, including previous experience with weight loss or weight gain prior to entering a weight control trial (Elfhag & Rössner, 2005; Thomas, 1991). For breast cancer survivors, pre-existing body image concerns resulting from weight fluctuations during adulthood may be exacerbated by cancer diagnosis and treatment, and should therefore be considered when examining body image dimensions. Our team (Fazzino, Hunter, Sporn, Christifano, & Befort, In Review) investigated the influence of weight fluctuation during adulthood and weight change since breast cancer diagnosis on body image dimensions in the full sample of this weight control trial (n = 210). We found that the largest weight fluctuation during adulthood and weight change since cancer diagnosis were both strongly associated with Total Body Image Score after accounting for the effects of current BMI, demographic, and treatment-related variables. Additionally, larger weight fluctuations in adulthood were related to poorer body image scores in regards to Sexuality, Changes in Social Activities, and Discomfort or Embarrassment due to Appearance. These analyses demonstrated the importance of considering weight history as an influential factor on dimensions of body image among breast cancer survivors, and may likely be contributing to some of the change in body image dimensions in this study.

Limitations

One limitation of this study is that it is difficult to assess the components of the intervention itself that directly improved body image dimensions from baseline to 6-months, as

the main focus of the larger trial was on weight loss and an improvement in lifestyle behaviors. The approaches targeting behavior change were integrative and combined components of cognitive behavioral therapy (CBT) and acceptance and commitment therapy (ACT) within a number of the sessions (e.g., Relapse Prevention, Managing Stress, Commit to Staying Active, and Surf the Urge). CBT- and ACT-based interventions have been found to be effective for treating body image distress in both healthy and cancer populations (Fingeret, Teo, & Epner, 2014), and could have contributed to the improvements found across body image dimensions in this study. Another limitation is that while Body Integrity was the only body image dimension to demonstrate a significant interaction effect between maintenance treatment condition and time, there was little data collected to assess the factors contributing to that effect. For example, it is likely that the continued group support during the study was a factor in minimizing negative change in Body Integrity, and it is not clear why only one dimension was impacted by the group support factor.

Finally, while the BIRS provided a useful multi-dimensional measure of body image in breast cancer survivors, some of the constructs included in the measure may not be as relevant to body image. For example, Changes in Social Activities, Energy and Strength, and Sense of Control subscales include items that may be measuring other constructs such as physical functioning (e.g., "Physical symptoms from breast cancer treatment prevented me from doing things I wanted to do," and "I had enough energy to do the things I wanted to do") and health locus of control (e.g., "I felt like I had some control over how healthy I was," and "The things that determined my health felt beyond my control"). Similarly, the Sexuality subscale only included three items, with one item focusing on the importance an individual places on sexual activity (e.g., "Sexual activity was an important part of my life"). This item is not necessarily a

reflection of sexual dysfunction or distress, and may not be providing the same type of information as the other two sexuality items (e.g., "I have been satisfied with my sex life" and "I have felt sexually attractive"). While these constructs may be influenced by changes in weight and physical activity over the course of a weight control trial, some items included in the BIRS may be more reflective of general changes that women who have undergone breast cancer treatment experience rather than a description of different dimensions of body image.

Implications

This study has a number of strengths and implications for further research and clinical practice. First, this is the only weight control trial investigating changes across body image dimensions, and predictors of those changes, in rural breast cancer survivors. Additionally, the multi-dimensional measure of body image used in this study was developed specifically for breast cancer survivors, and was utilized within a longitudinal design to capture the changes occurring during a weight loss and weight maintenance intervention. This study was also able to provide evidence that weight loss alone does not account for all improvements in body image. Additionally, given evidence that weight regain has a negative impact on dimensions of body image, interventions should continue focusing on ways to not only reduce regain, but also reduce the psychological impact resulting from regain in order to prevent regressing to previous unhealthy behaviors.

Finally, this study provides evidence of the resilience of breast cancer survivors. While there is some evidence that invasive surgeries or extensive rounds of chemotherapy and radiation lead to long-lasting body image distress, the current sample has shown that such factors are not necessarily strong predictors of negative body image across dimensions. There are clearly a

number of other unique factors contributing to whether those treatment-related factors will result in body image distress.

Future Directions

Given recent evidence of the utility of ACT in weight loss and physical activity interventions (Butryn, Forman, Hoffman, Shaw, & Juarascio, 2011), future work should outline how ACT-based interventions fare longitudinally when examining weight loss, weight regain, and changes in body image dimensions. Additionally, more research should be done investigating the moderating and mediating pathways between predictor variables and changes in body image, accounting for other important factors such as self-efficacy and weight history. Finally, given that body image can be influenced by a weight control intervention directly or indirectly, it may be useful to incorporate healthy lifestyle and weight control groups in survivorship programs at cancer centers around the country. This will not only target the weight gain that is central to risk of recurrence, but will also help improve body image dimensions.

Conclusion

In conclusion, this study demonstrates that dimensions of body image improve over the course of a weight loss intervention, and tend to worsen over the course of a weight maintenance intervention, regardless of intervention delivery modality. These changes in body image are predicted by a number of demographic, treatment-related, quality of life, distress, and intervention-related variables, all of which vary across body image dimensions. Despite the worsening in body image dimensions observed during the weight maintenance intervention, it appears that the improvements gained during the weight loss intervention, regardless of the amount of weight lost, were only partially attenuated during weight regain.

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Appendix A

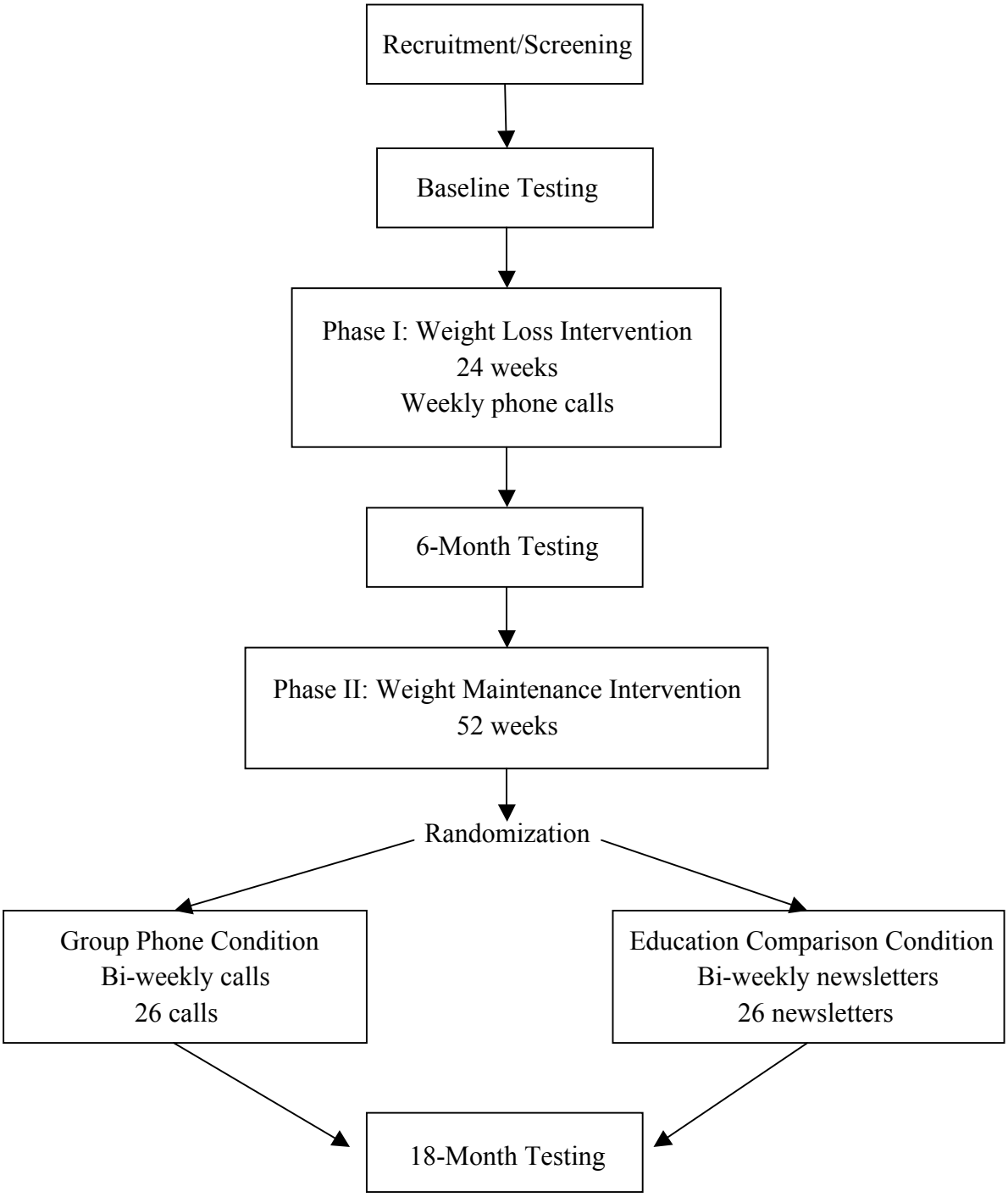

Figure 1. Flow chart of study design and procedures.

Appendix B

Topic
Week 1 – Getting Started
Week 2 – Self-Monitoring
Week 3 – Get Moving to Better Health
Week 4 – Goal Setting for Success
Week 5 – Making Social Cues Work for You
Week 6 – Fruits and Veggies: More Matters
Week 7 – Physical Activity and Breast Cancer
Week 8 – Courage and Strength
Week 9 – Food Labels
Week 10 – Taking Charge of What's Around You
Week 11 – Grocery Shopping
Week 12 – Eating on the Go
Week 13 – Eating More for Less
Week 14 – Nutrition and Breast Cancer Part 1
Week 15 – Nutrition and Breast Cancer Part 2
Week 16 – Menopausal Symptoms
Week 17 – Exercise Intensity
Week 18 – Relapse Prevention
Week 19 – Eating at Social Gatherings
Week 20 – MyPlate
Week 21 –My Personal Plan
Week 22 – Do You See Yourself?
Week 23 – Managing Stress
Week 24 – Planning for the Maintenance

Figure 2. Session topic schedule for weight loss phase.

Appendix C

Session	Objective	Topic
1	Life Lessons	Power of Problem Solving
2	Nutrition News	Meal Planning
3	Fitness Flash	SMART Goal Incentives
4	Survivor Support	Fear of Recurrence
5	Life Lessons	Making Peace with the Scale
6	Fitness Flash	Interpreting Accelerometer Data
7	Nutrition News	Supplements
8	Planning and Prevention	Eating Out and Regain
9	Nutrition News	Filling up with Fiber not Fat!
10	Life Lessons	Managing Stress
11	Survivor Support	Building a Beautiful Body Image
12	Nutrition News	Keeping Nutrition Information in Perspective
13	Planning and Prevention	Coping at Potlucks
14	Fitness Flash	Exercise at Home
15	Life Lessons	Successful Social Support
16	Planning and Prevention	Acceptance and Commitment
17	Nutrition News	Decisions, Decisions
18	Life Lessons	Mindful Eating
19	Planning and Prevention	Holiday Planning
20	Fitness Flash	Commit to Staying Active
21	Survivor Support	Breast Cancer in the News
22	Fitness Flash	Fitness and Your Health
23	Life Lessons	Cancer 101/Guest Speaker
24	Planning and Prevention	Surf the Urge
25	Life Lessons	Staying Positive

Figure 3. Session topic schedule for weight maintenance phase.

Appendix D

	Factor Loadings					
Item	Changes in Social Activities	Energy & Strength	Discomfort or Embarrassment due to Appearance	Body Integrity	Sense of Control	Sexuality
13. I restricted my social activities because of physical symptoms that I attribute to my breast cancer treatment (surgery, chemotherapy, radiation).	0.731					
14. I was uncomfortable with or embarrassed by physical symptoms that I attribute to my breast cancer treatment (surgery, chemotherapy, radiation).	0.782					
15. Physical symptoms from breast cancer treatment (surgery, chemotherapy, radiation) prevented me from doing things I wanted to do.	0.756					
18. I restricted my social activities because of my physical appearance.	0.586					
21. I was embarrassed by my hot flashes.	0.881					
22. I restricted my social activities because of my hot flashes.	0.929					
23. Hot flashes prevented me from doing things I wanted to do.	0.916					
25. I restricted my social activities because of changes in my physical appearance that I attribute to my breast cancer surgery.	0.828					
26. Changes in my physical appearance that I attribute to my breast cancer surgery prevented me from doing things I wanted to do.	0.846					
7. I felt physically powerful.		0.611				
8. I felt physically fit.		0.636				
9. I felt physically capable of all the things I wanted to do.		0.730				

12. My body was strong.		0.677				
27. I had enough energy to do the things I wanted to do.		0.759				
28. I was uncomfortable with or embarrassed by my lack of energy.		0.745				
29. My lack of energy prevented me from doing things I wanted to do.		0.821				
10. I felt uncomfortable or embarrassed because I was out of shape.			0.570			
16. I was comfortable with the appearance of my body.			0.559			
17. I was uncomfortable with or embarrassed by the appearance of my body.			0.555			
19. I was comfortable changing clothes and showering in the women's locker room of a fitness facility.			0.568			
20. I was uncomfortable with or embarrassed by changing clothes and showering in the women's locker room of a fitness facility.			0.670			
1. My body felt natural to me.				0.752		
2. My body felt healthy to me.				0.636		
3. My body felt whole to me.				0.641		
4. I felt confident I could make myself stronger.					0.612	
5. I felt like I had some control over how healthy I was.					0.757	
6. The things that determined my health felt beyond my control.					0.721	
30. I have been satisfied with my sex life.						0.683
31. Sexual activity was an important part of my life.						0.657
32. I have felt sexually attractive.						0.485

Omitted Items						
11. Being out of shape prevented me from doing things I wanted to do.	0.424	0.537				

24. I was embarrassed by changes in my physical appearance that I attribute to my breast cancer surgery.	0.742		0.302			

Table 1. Factor loadings for the BIRS (Hormes et al., 2008). A six-factor solution is supported within a rural breast cancer sample